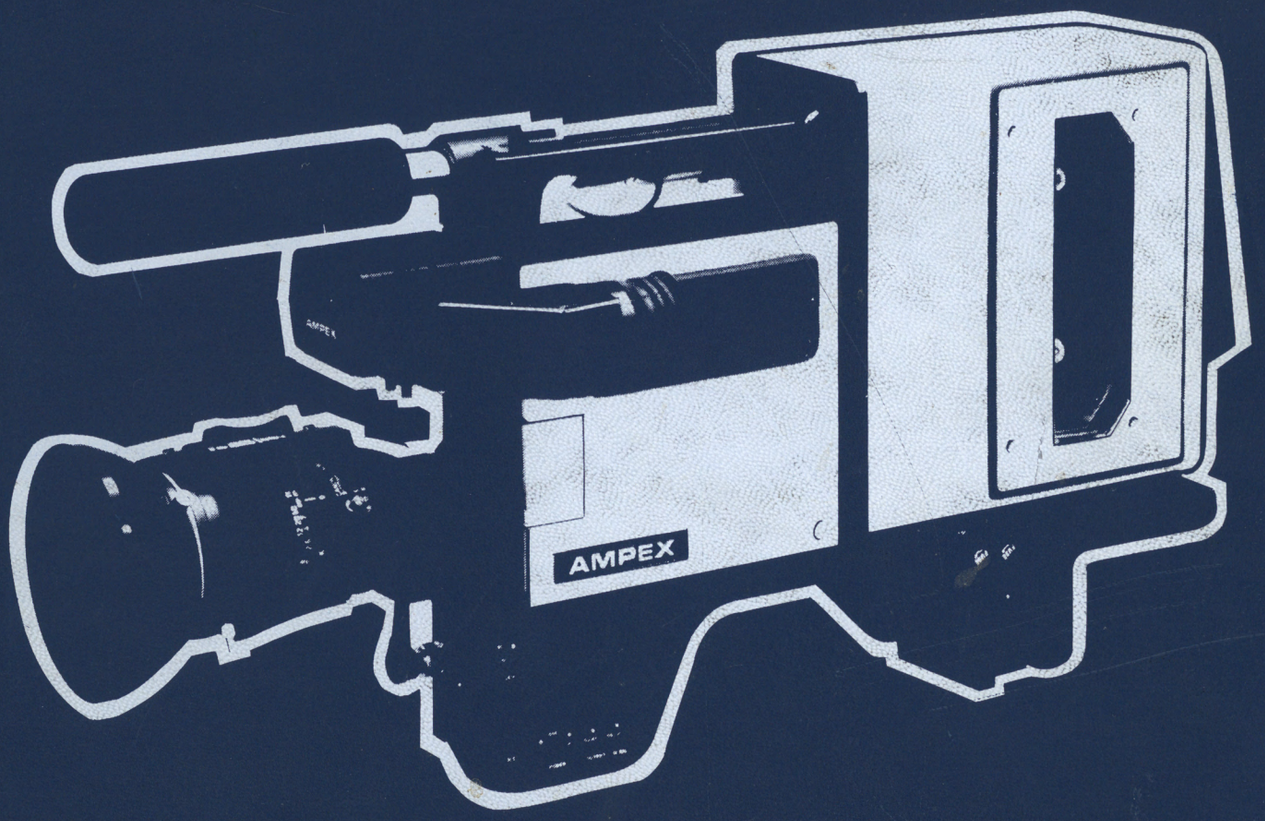
ARC-10

PORTABLE RECORDER/CAMERA

SERVICE MANUAL 1809596



AMPEX

Catalog No. 1809596-01
Issued: February 1984

ARC-10
PORTABLE RECORDER/CAMERA

SERVICE MANUAL

AMPEX CORPORATION
AUDIO-VIDEO SYSTEMS DIVISION

Prepared by

AVSD Technical Publications
Ampex Corporation
401 Broadway
Redwood City, CA 94063

Catalog No. 1809596-01
Issued: February 1984

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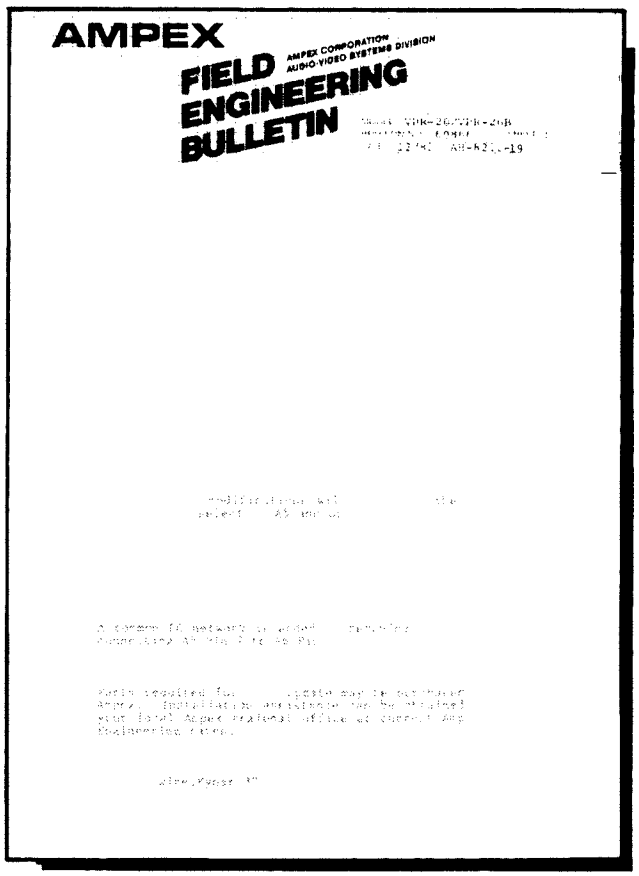
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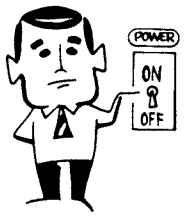
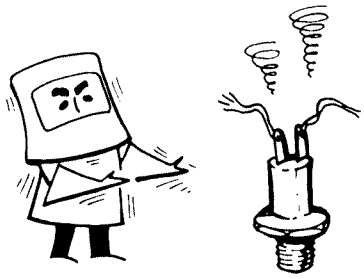
SAFETY AND FIRST AID SUGGESTIONS

Regardless of how well electrical equipment is designed, personnel can be exposed to **dangerous electrical shock** when protective covers are removed for maintenance or other activities. Therefore, it is incumbent on the user to see that all safety regulations are consistently observed and that each individual assigned to the equipment has a clear understanding of first aid related to electrical hazards.

In addition, the following safety practices must be followed:



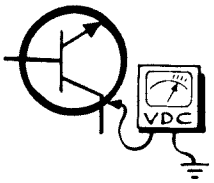
1 Do not attempt to adjust unprotected circuit controls or to dress leads with power **on**.



2 Do not touch heavily loaded or overheated components without precaution to avoid burns.

3 Do not assume that all danger of electrical shock is removed when power is **off**. Charged capacitors can retain dangerous voltages for a long time after power is removed. These capacitors should be discharged through a suitable resistor before any circuit points are touched.

4 Always avoid placing parts of the body in series between ground and circuit points.



5 Remember that some semiconductor cases and solid-state circuits carry high voltages.

6 Don't take chances. Be fully trained. Ampex equipment should be operated and maintained by fully qualified personnel.

If someone seems unable to free himself while receiving an electrical shock, **turn power off** before attempting to render aid. A muscular spasm or unconsciousness can make a victim unable to free himself from the electrical power.

WARNING

DO NOT TOUCH VICTIM OR HIS CLOTHING BEFORE POWER IS REMOVED OR YOU MAY ALSO BECOME A SHOCK VICTIM.

If power cannot be removed immediately, **very carefully** loop a length of dry nonconducting material (such as rope, insulating material, or clothing) around the victim and pull him free of the power. Carefully avoid touching him or his clothing until free of power. Immediately start the appropriate first aid procedures.

GOOD PRACTICES

In maintaining the equipment covered in this manual, please keep in mind the following standard good practices:

1 When connecting any instrument (oscilloscope, waveform monitor, etc.) to a high-frequency output, use the appropriate termination resistor at the input of the instrument, unless the instrument is terminated internally.

2 When inserting or removing printed wiring assemblies (PWAs), cable connectors, or fuses, always turn off power to the affected portion of the equipment. After power is removed, allow sufficient time for the power supplies to bleed down before reinserting PWAs.

3 When troubleshooting, remember that FETs and other metal-oxide-semiconductor (MOS) devices may appear defective because of leakage between traces or component leads on the printed wiring board. Clean the printed wiring board and recheck the MOS device before assuming it is defective.

4 When replacing MOS devices, follow standard practices to avoid damage caused by static charges and soldering.

5 When removing components from PWAs (particularly ICs), use care to avoid damaging PWA traces.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case, the user, at his own expense, will be required to take whatever measures may be necessary to correct the interference.

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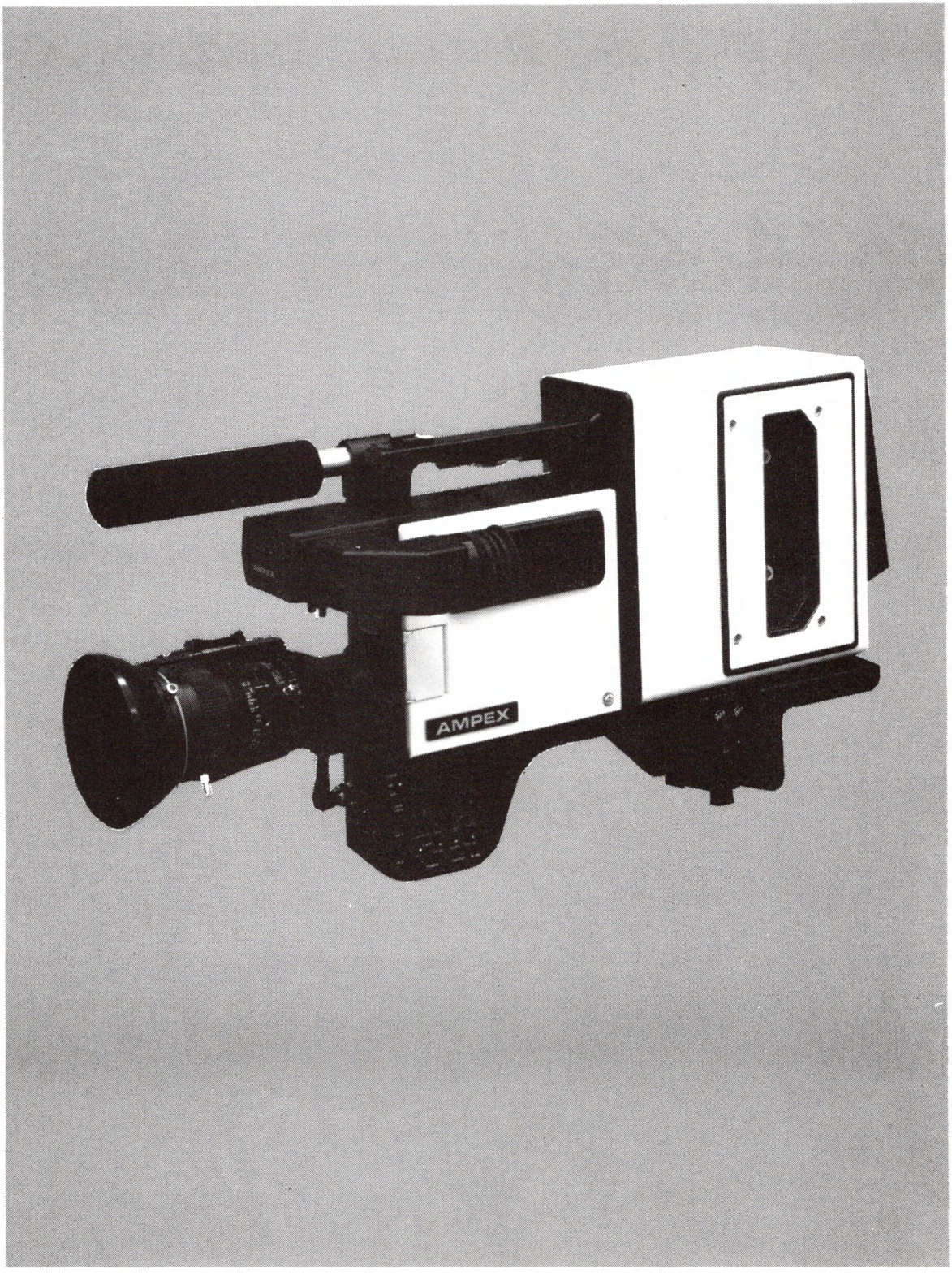


ARC-10 Portable Camera/Recorder

SECTION 1
GENERAL INFORMATION

1-1 PURPOSE AND SCOPE OF MANUAL

This manual provides general information, installation instructions, operating instructions, and theory and maintenance information for the ARC-10 Portable Camera/Recorder, Ampex Part No. 1418010. Information pertaining to the Video Adapter is included. Section 1, *General Information*, provides a description of the ARC-10 and its accessories, including standard and optional equipment, and specifications. Section 2, *Installation*, provides unpacking and inspection instructions and typical system interconnection diagrams. Section 3, *Operation*, describes operator controls and indicators, provides operational procedures and checks, and some setup procedures that can be performed by the camera operator. Section 4, *Theory of Operation*, provides details of the theory of operation of the camera's electronics and Section 5, *Maintenance*, provides camera alignment procedures. Section 6, *Genlock Adapter*, provides installation information, and theory of operation, for the Genlock Adapter Accessory.

1-2 RELATED PUBLICATIONS

The following publications can be used in association with the ARC-10 Portable Camera/Recorder:

- *ARC-40 Studio Videotape Recorder/Reproducer Installation and Operation* manual, Ampex Catalog No. 1809597-01
- *ARC-30 Editing Controller Service* manual, Ampex Catalog No. 1809598-01

1-3 DESCRIPTION

The ARC-10 is an integrated color camera and record-only videotape recorder combination that incorporates all picture-taking and video-recording functions in a single lightweight unit. The ARC-10 is well suited for EFP and ENG applications. It provides broadcast quality video (PAL or NTSC) approaching that of a 1-in. VTR and has portability and excellent balance. It can be powered from either a self-contained rechargeable battery or an external supply. The ARC-10 weighs approximately 23 lb with the VTR, lens, 1.5-in. viewfinder, and battery-pack.

The camera section uses a dichroic prism and three 2/3-in. pickup tubes. Depending on customer requirements, the camera can be ordered in 2/3-in. Plumbicon or Saticon versions. The camera section weighs less than 9 lb including the 1.5-in. viewfinder.

The VTR is a record-only, four-head helical-scan type weighing approximately 9 lb. It records in the M format on VHS-type cassettes. Tape speed is 20 cm/s providing

a maximum record time of 20 min. Tape recorded on the ARC-10 can be played back only on the ARC-40 Studio VTR or equivalent M-format playback VTR.

The recorder section and the camera section of the ARC-10 need not be used only as a combination; available accessories permit them to be used independently. The camera section is the FPC-10, Field Production Camera, Ampex Part No. 1418100. The recorder section is the FPR-10, Ampex Part No. 1418600. When the camera is detached from the recorder, the optional Genlock Adapter accessory, Ampex Part No. 1418550, can be connected to the camera, permitting it to be used as a conventional ENG/EFP camera with exceptional S/N and size/weight characteristics. Excellent balance is maintained when either the VTR or the Genlock adapter is used with the camera.

The FPR-10 can be separated from the FPC-10 camera and records from any NTSC video producing source when an NTSC Video Adapter, Ampex Part No. 1418650, is used. The video adapter converts NTSC composite video into separate Y, I, and Q signals (refer to paragraph 1-4).

1-4 Recording System

The ARC-10 recorder/camera combination uses the M-format system. In this system, Y, I, and Q signals from the video camera are recorded on two adjacent video tracks, the Y signal on one track and the I/Q signal on the other track (see Figure 1-1).

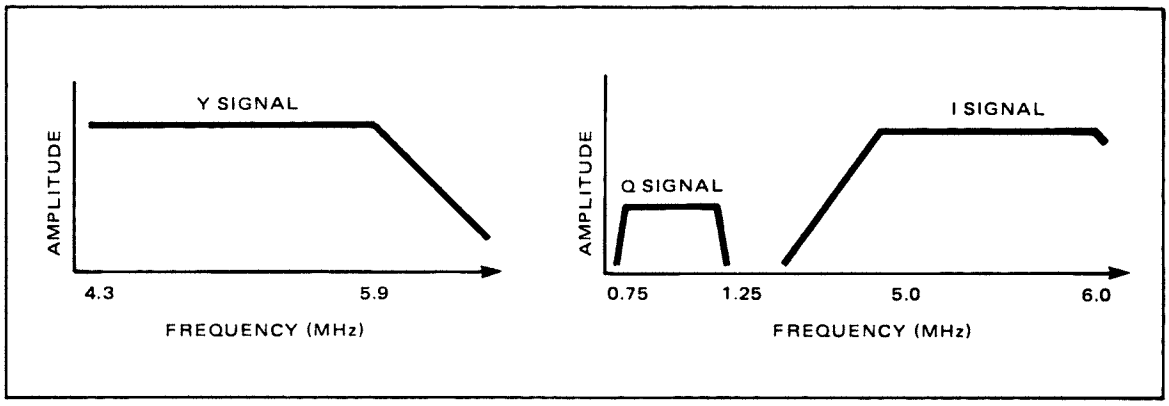


Figure 1-1. Recorded I and Q Signals

Tape transport of the ARC-10 recorder/camera is shown in Figure 1-2. The video signal is separated into the Y and I/Q signals prior to being recorded. There are four video recording heads.

As shown in Figure 1-3, the two video signals, two audio signals, and time code/control signals are recorded on their respective tracks on the tape. Tape moves at a speed of about 8 in/s (20 cm/s).

1-5 Features of the VTR Section

Features of the ARC-10's VTR section are:

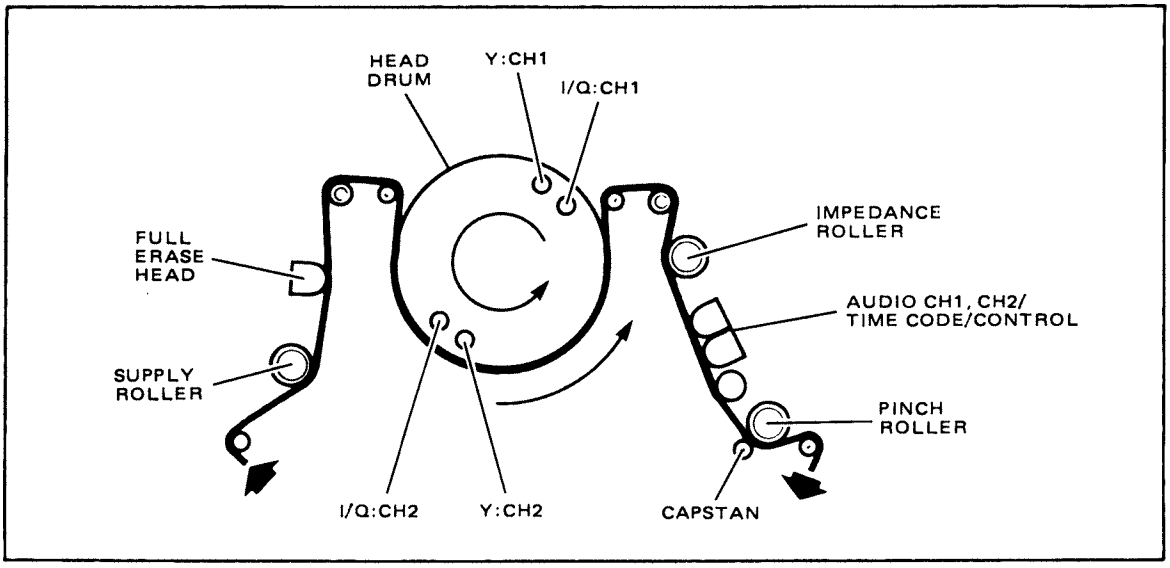


Figure 1-2. ARC-10 Recorder/Camera Tape Transport

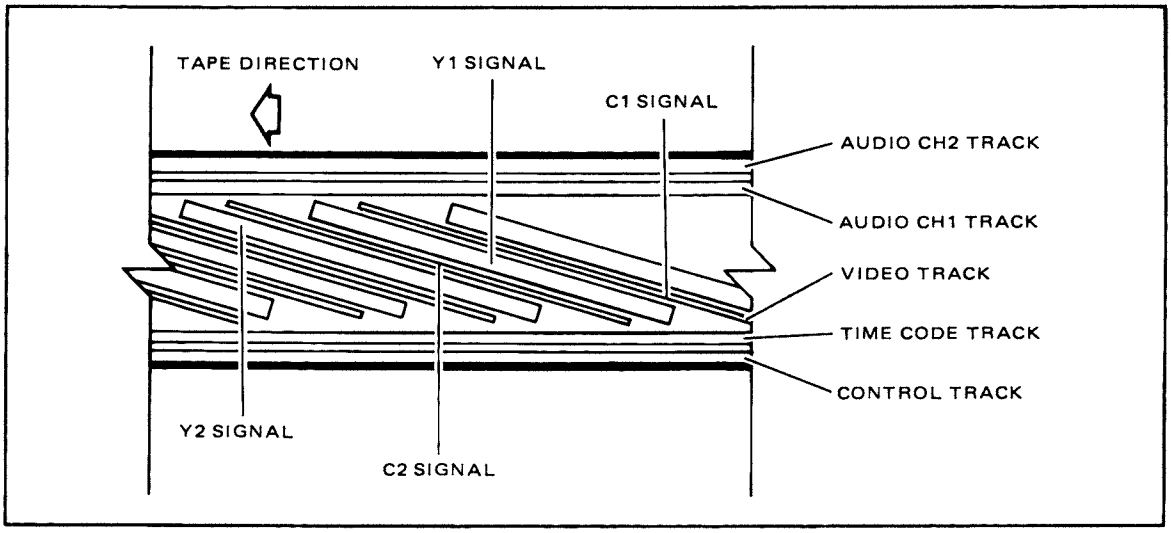


Figure 1-3. ARC-10 Videotape Format

- **High Picture Quality**—The VTR, using the 1/2-in. M-format recording method and high tape speed (about 20 cm/s), produces picture quality that approaches that of a 1-in. VTR.
- **Y/I/Q Recording System**—M-format separates video signal into Y and I/Q components which are recorded on tape by separate heads.
- **Light Weight**—VTR weighs about 9 lb (4.1 kg)
- **Simple Operation**—Only four function buttons provided: fast forward, rewind, stop, and cassette eject. All are feather-touch direct operation buttons. Recording is enabled or stopped by operating a switch on camera.

- **Auto Backspace Mechanism**—When shooting is momentarily stopped by pushing the start/stop switch on the camera, tape is automatically rewound for about 30 frames (approx 1.0s) in preparation for next shooting sequence. This provides smooth picture continuity between scenes.
- **Built-In SMPTE Time Code Generator**—Supplies time code for recording on the dedicated track.
- **Two Audio Channels (600Ω, balanced)**—Two separate high-quality audio channels are available for recording sounds.
- **Alarm Functions**—Alarm sensing circuits are activated when drum servo or capstan servo is unlocked, when tape is slack, and when shutdown occurs because of dew. Indicators in viewfinder light and indicate cause of malfunction. An LED display blinks to warn when there is about 1 min of tape left; display stays lit at end of tape.

1-6 Features of the Camera Section

Features of the ARC-10 camera section are:

- **Choice of Tube Type**—Camera can be supplied with a 2/3-in. LOC diode-gun Plumbicon* or 2/3-in. S-M Saticon**.
- **Optical System**—A medium index prism is used, providing good weight distribution and low center of gravity. A bias light is incorporated in the optical system to minimize low light lag.
- **High Sensitivity**—Normal lens iris for full video output is at f4.0 for the LOC diode-gun Plumbicon and at f3.5 for the Saticon when a 90% reflectance chart is illuminated at 1450 lux. When the +18 dB sensitivity switch is activated, minimum illumination in each case is 29 lux/f1.6 and 38 lux/f1.6, respectively. Gain boost (+9dB, +18dB) switches are located on front of camera.
- **High Resolution and Signal-to-Noise Ratio**—These ratings are 600 lines and 59 dB for the Plumbicon, 550 lines and 58 dB for the Saticon (gamma and detail off).
- **Automatic Lens Closing Circuit**—Prevents light from entering pickup tubes when power is switched off or during standby.
- **EIA RS-170A Built-In Sync Generator**—Camera uses broadcast standard EIA RS-170A sync generator. Horizontal and vertical blanking width is adjustable from 10.0 to 11.5 µs and 18 to 21 lines, respectively.
- **Gamma Circuit**
  Gamma 0.4 to 0.5—Adjustable
  Gamma OFF—Switchable
- **Feedback Beam Control (FBC) Circuit**—Decreases comet tailing caused by shortage of tube beam current on highlight portions of scenes.

---

* T.M., N.V. Philips
**T.M., Hitachi

- **Aperture Correction Circuits**—Uses 2-line type vertical aperture and comb filter type horizontal aperture circuit for clean sharp pictures.
- **Corner Registration Compensation Circuit**—Compensates corner misregistration caused by mechanical distortion of pick-up tube and coil assembly.
- **Corner Shading Compensation Circuit**—Compensates corner shading caused by pick-up tube and coil assembly.
- **Modulation Shading Compensation Circuit**—Compensates modulation shading caused by optical system.
- **Dynamic Focus Circuit**—Improves H-resolution of the picture circumference.
- **Y/I/Q Encoder**—Camera unit has a Y/I/Q encoder in addition to normal NTSC encoder. The Y signal and base band I and Q signals are formatted for M-type recording.
- **Black Stretch Circuit**—A black stretch circuit increases contrast in the dark and shaded areas.
- **Matrix Circuit**—Improves color reproduction and facilitates camera matching by allowing individual adjustment of red, blue, and green while maintaining white balance.
- **Automatic Black Balance Circuit**—Corrects deviations in black balance due to fluctuations of ambient temperature, etc.
- **Automatic White Balance Circuit**—Corrects deviations in white balance caused by variations in color temperature of scene lighting. Auto white/black balance information is stored in memory in the form of 8-bit codes. Memory is maintained by means of a small nickel-cadmium battery that powers this memory only.
- **Automatic Iris Control Circuit**—Adjusts the iris for correct exposure at varying light levels.
- **Knee Circuit**—Improves contrast in high light levels of picture.
- **Pulse Cancel Circuit**—Maintains red, green, blue, black level of the picture to prevent black unbalance during high-gain (+9 dB, +18 dB) operation.
- **Minimal Radio Frequency Interference**—RFI minimized by RFI filters for cable, battery, and mic cable input connectors.
- **Wide Operating Temperature Range**—Temperature-compensated voltage-controlled crystal oscillator circuit maintains 3.579545 MHz ±10 Hz from -4°F to 122°F (-20°C to 50°C).
- **Low Power Consumption**—17W* (magnetic focus, magnetic deflection Plumbicon type) 15W (static focus, magnetic deflection).
- **Test Signals**—EIA color bars, focus rock, and sawtooth generator circuits are built in.

*Including 1.5-in. viewfinder.

- **Built-in Optical Filters**—Two optical filters are used in the Plumbicon model.
  ND Filter: 100%, 25%, 6.5%, Closed
  CC Filter: 3200 K, 4700 K, 5600 K, 7500 K
- **Viewfinder**—The 1.5-in. viewfinder is a high resolution type. The video level (serrated image), audio 1 level (horizontal white bar), audio 2 level and power supply voltage (horizontal white bar) are indicated in the viewfinder. Tally, VTR warning, power supply voltage warning, and tape consumption are indicated by LEDs.

1-7 ARC-10 Portable Recorder/Camera Accessories

Accessories available for use with the ARC-10 recorder camera include:

- **NTSC Video Adapter**—A signal-converting adapter that separates the Y, I, and Q signals from any NTSC composite signal video source for recording on the FPR-10 VTR. An LED indicator tells how much tape has been used. Channel 1 and channel 2 audio input levels can be independently adjusted.
- **Extension Cable (standard accessory)**—Used when adjusting the Video Process PWA. See Figure 1-4.

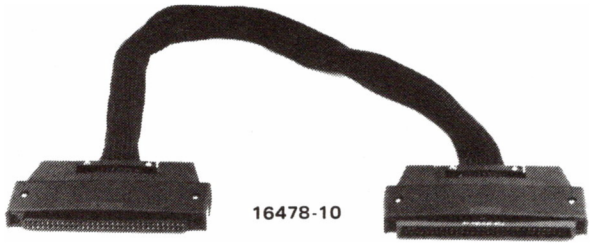


Figure 1-4. Extension Cable

Other ARC-10 accessories are listed in Table 1-1. Video adapter accessories are listed in Table 1-2.

Table 1-1. ARC-10 Recorder/Camera Accessories

Accessory	Part No.
Viewfinders	
1-1/2 in.	1418104
4-1/2 in.	1418105
Tube Sets	
Saticon	1418590
Diode-gun Plumbicon	1418591
Low Capacitance Diode-gun Plumbicon	1418592

(Continued next page)

Table 1-1. ARC-10 Recorder/Camera Accessories (Continued)

Accessory	Part No.
Power Supplies	
Battery Pack	1418570
Battery Charger	1418571
AC Adapter Power Unit	1418572
Genlock Adapters	
Genlock Adapter, NTSC	1418550
Genlock Adapter, PAL	1418560
Camera Remote Control Unit	1418570
Video Adapters	
Video Adapter, PAL	1418670
Video Adapter, NTSC	1418650
VTR Extender Cable	1418605
Lenses	
Cannon J15x9.5, 1418565	
Cannon J13X9, B4IRE	1418566
Fuji A14x9, ERM	1418568
Fuji A14x10 ERM	1418567

Table 1-2. NTSC Video Adapter Accessories

Standard Accessories
Shoulder strap Shoulder strap fixture
Optional Accessories
Soft case 10p - 26p conversion camera cable 14p - 26p conversion camera cable

1-8 ARC-10 SPECIFICATIONS

Specifications for the camera (with Saticon tubes installed) are listed in Table 1-3. Specifications for the camera (with Plumbicon tubes installed) are listed in Table 1-4. VTR specifications are listed in Table 1-5. Video adapter specifications are listed in Table 1-6.

Table 1-3. FPC-10S Portable Camera (Saticon) Specifications

Item	Specifications
Power Requirements:	DC 10.5 to 17.0V, 1.25A
Television System:	NTSC color signal EIA standard 525 lines, 60 fields, 30 frames
Optical System:	Middle index prism
Pick-Up Tubes:	Three 2/3 Plumbicon
Signal-to-Noise Ratio:	Typical 58dB (luminance channel, aperture correction off, gamma = 1.0 0dB gain)
Sensitivity:	200 footcandles, f/3.5, 3200°K, illuminant, 60% reflectance
Horizontal Resolution:	550 lines
Registration **Zone 1:** **Zone 2:** **Zone 3:**	 0.1% (circle in center = 0.8 picture height) 0.2% (circle in center = picture height) 0.5% (area outside zone 2)
Geometric Distortion:	Less than 2%
Encoder:	NTSC, Y/I/Q
Microphone Input:	-70 dBm, balanced, XLR connector
Monitor Video Output (Switchable):	Composite, Red, Green, Blue, R-G, B-G
Blanking **Horizontal:** **Vertical:**	 10.7 µs, variable 19 lines variable
Gamma:	Adjustable from 0.4 to 0.55 Switchable to 1.0
Vertical Aperture Correction:	Self-contained 2-line type
Self-Contained Test Signal Generators:	EIA standard color bars, focus wobbling, sawtooth
Filter Wheel Four Positions:	(0) Cap (1) Clear (3200°K) (2) 4700°K (3) 5600°K + 0.25ND
Operating Conditions:	-4°-113°F (-20° -45°C) Less than 90% humidity

(Continued next page)

Table 1-3. FPC-10S Portable Camera (Saticon) Specifications (Continued)

Item	Specifications
Stability:	Specifications are met over a temperature range of ±18°F (±10°C) of the set-up ambient temperature
Dimensions (W x H x D):	3 5/8 x 10 3/8 x 7 3/8 in. 4 5/8 x 13 1/8 x 8, including docking plate (90 mm x 261 mm x 186.5 mm 117.3 mm x 330.6 mm x 201.5 mm, including docking plate)
Weight:	8.25 lb (3.75 kg), including 1 1/2-in. viewfinder
Lens:	Bayonet mount
Viewfinder:	1.5-in. CRT
External Controls **Front:**	Auto white/black balance 0/ +9dB/ + 18dB Power: off/camera/camera + VTR Operate/standby Camera/color bars Gain: auto/pre-set Audio channel 1 level Audio channel 2 level
Setup Panel:	Viewfinder video: R, B, G, -G, NTSC Detail: on/off Indicator: battery/audio channel 2 Master black level H and V centering of R and B channel
Power Source:	Power; battery/external Battery bracket; quick mounting bracket
1 1/2-In. Viewfinder:	Tally; on/off Indicator; on/off Peaking; on/off Brightness Contrast

Table 1-4. FPC-10P Portable Camera (Plumbicon) Specifications

Item	Specifications
Power Requirements:	DC 10.5 to 17.0V, 1.45A
Television System:	NTSC color signal EIA standard 525 lines, 60 fields, 30 frames
Optical System:	Middle index prism
Pickup Tubes:	Three 2/3-in. Plumbicon
Signal-to-Noise Ratio:	Typical 58 dB (luminance channel, aperture correction off, gamma - 1.0 0dB gain) LOC diode gun Pbo
Sensitivity:	200 footcandles, f/4.0, 3200K, illuminant, 60% reflectance
Horizontal Resolution:	600 lines
Registration: **Zone 1:** **Zone 2:** **Zone 3:**	 0.1% (circle in center = 0.8 picture height) 0.2% (circle in center = picture height) 0.5% (area outside zone 2)
Geometric Distortion:	Less than 2%
Encoder:	NTSC, Y/I/Q
Microphone Input:	-70 dBm, balanced, XLR connector
Monitor Video Output (Switchable):	Composite, Red, Green, Blue, R-G, B-G
Blanking: **Horizontal** **Vertical**	 10.7 µs, variable 19 lines, variable
Gamma:	Adjustable from 0.4 to 0.55 Switchable to 1.0
Vertical Aperture Correction:	Self-contained 2-line type
Self-Contained Test Signal Generators:	EIA standard color bars, focus wobbling, sawtooth
Filter Wheel Color Conversion Filter:	(A) Clear (B) 4700°K (C) 5600°K (D) 7500°K

(Continued next page)

Table 1-4. FPC-10P Portable Camera (Plumbicon) Specifications (Continued)

Item	Specifications
Filter Wheel (Continued)	
Neutral Density Filter:	(0) Cap (1) Clear (2) 25% (3) 6.5%
Operating Conditions:	-4° 22° (-20° 50°C) Less than 90% humidity
Stability:	Specifications are met over a temperature range of ±18°F (±10°C) of the set-up ambient temperature
Dimensions (W x H x D):	3 5/8 in. x 10 3/8 in. x 7 3/8 in. 4 5/8 in. x 13 1/2 in. x 8 in., including docking plate (90 mm x 261 mm x 186.5 mm 117.3 mm x 330.6 mm x 201.5 mm, including docking plate)
Weight:	8.66 lb (3.93 kg), including 1 1/2-in. viewfinder
Lens:	Bayonet mount
Viewfinder:	1.5-in. CRT
External Controls **Front:**	Auto white/black balance 0/ +9dB/ +18 dB Power: off/camera/camera + VTR Operate/standby Camera/color bars Gain: auto/pre-set Audio channel 1 level Audio channel 2 level
Setup Panel:	Viewfinder video; R, B, G, -G, NTSC Detail; on/off Indicator: battery/audio channel 2 Master black level H and V centering of R and B channel
Power Source:	Power; battery/external Battery bracket; quick mounting bracket

(Continued next page)

Table 1-4. FPC-10P Portable Camera (Plumbicon) Specifications (Continued)

Item	Specifications
1 1/2-In. Viewfinder:	Tally; on/off Indicator; on/off Peaking; on/off Brightness Contrast

Table 1-5. FPR-10 Portable VTR Specifications

Item	Specifications
General	
Power Source:	12.0, -1, +3 Vdc
Power Consumption:	12W (nominal dc 12V)
Video Recording System:	4 rotary heads, 2-track helical scanning system
Tape Speed:	8 in/s (204.5 mm/s)
Recording Time:	20 min (T120 HG VHS cassette)
FF/REW Time:	Less than 5 min
Tape:	T120 HG VHS cassette
Dimensions (W x H x D):	4 1/4 in. x 9 1/8 in. x 9 1/2 in. (120 mm x 237 mm x 240 mm)
Weight:	9.0 lb (4.1 kg)
Video	
Television System:	NTSC system, 525 lines, 60 fields
Modulation System:	2 channel Y/I/Q frequency modulation I/Q frequency multiplexing
Bandwidth	
Luminance:	3.0 MHz, -1 dB
Chrominance:	1.0 MHz, -1 dB
Signal-to-Noise Ratio	
Luminance:	Better than 47 dB
Chrominance:	Better than 48 dB

Table 1-6. NTSC Video Adapter Specifications*

Item	Specifications
General	
Power requirements:	dc 12V
Power consumption:	Approx 4.5W
****Weight:**	Approx 3.08 lb (1.4 kg)
****Dimensions:**	4-3/4 in. (W) x 9-3/8 in. (H) x 2-1/2 in. (D) 118 (W) x 237 (H) x 63 (D) mm
Video	
Inputs:	
CAMERA (26 pin):	Standard NTSC signal Y/C separated signal Y/I/Q signal
VIDEO (BNC):	Standard NTSC signal, 1.0 Vp-p, 75Ω
Audio	
Inputs:	
AUDIO CH 1 (XLR):	+4 dBm/ -20 dBm/-60 dBm (selectable), 600Ω, balanced
AUDIO CH 2 (XLR):	+4 dBm/-60 dBm (selectable), 600Ω, balanced
Environmental	
Ambient temperature:	32°F - 104°F (0°C - 40°C)
Ambient humidity:	20% - 85%

* Specifications are subject to change without notice.
**Weight and dimensions shown are approximate.

1-9 TYPICAL SYSTEM CONFIGURATIONS

1-10 ARC-10 Portable Recorder/Camera System

A typical configuration of the ARC-10 camera system is shown in Figure 1-5. The system can be powered from an ac adapter or a battery pack. When fully charged, the battery pack provides power for about 100 minutes of continuous recording. A battery charger is available. Charging time depends on environmental conditions. At +20° C, high speed charging takes about two hours.

1-11 FPC-10 Portable Camera With Portable VTR (Not FPR-10)

The FPC-10 portable camera can supply video to any suitable non-M-format VTR when the optional genlock adapter is used. Complete information concerning the

adapter is given in Section 6 of this manual. The FPC-10 camera, configured to supply video to any suitable VTR other than the FPR-10, is shown in Figure 1-6.

1-12 FPR-10 Portable VTR With Portable Camera (Not FPC-10)

The FPR-10 Portable VTR can record video supplied by any composite video producing camera provided that the VTR is configured with an optional video adapter. See Figure 1-7.

1-13 ARC-30 Edit Control Unit and ARC-40 Studio VTR System Configuration

The ARC-30 Edit Control Unit and the ARC-40 Studio VTR are shown configured for playback, dubbing, and editing in Figure 1-8.

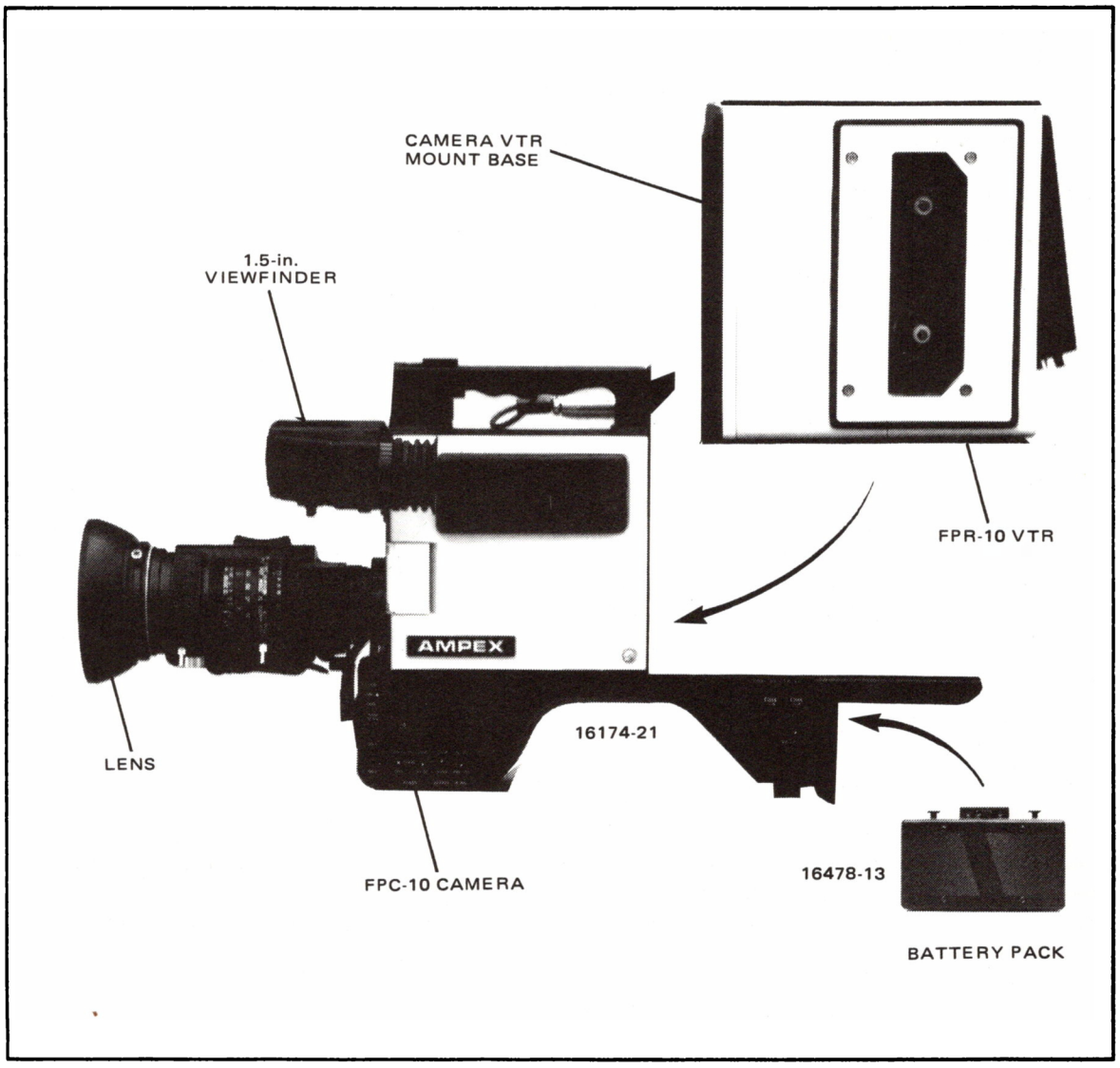


Figure 1-5. ARC-10 Portable Recorder/Camera System

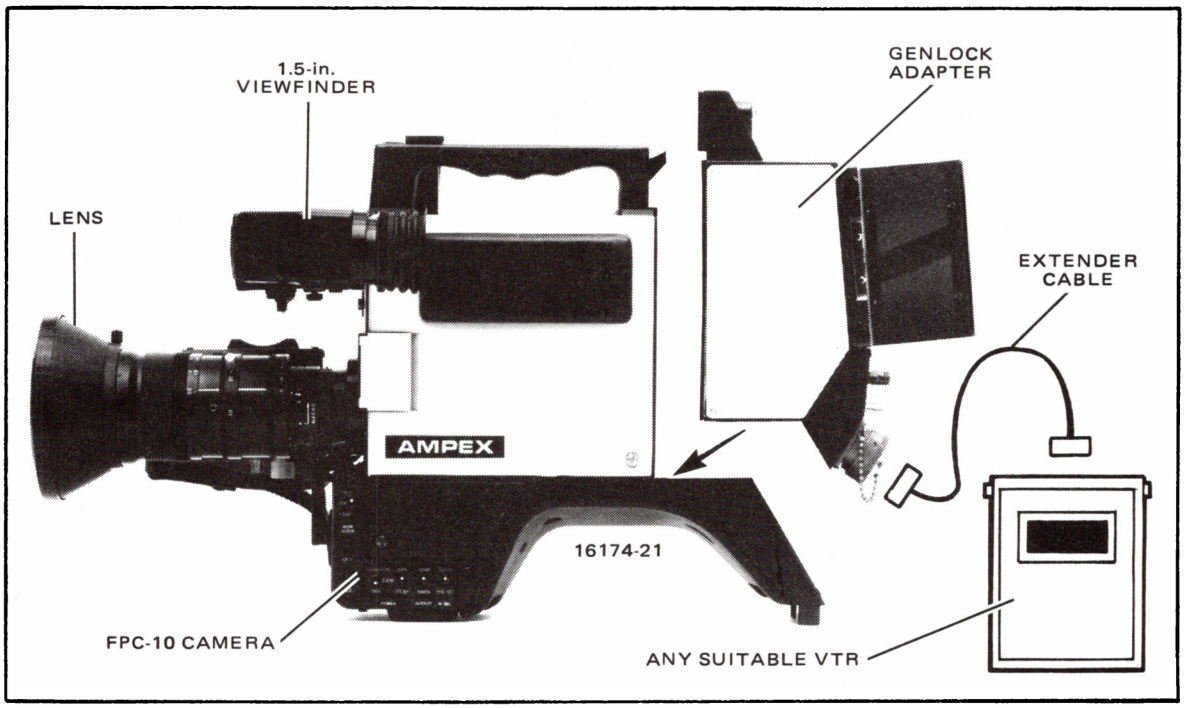


Figure 1-6. FPC-10 Portable Camera With Portable VTR (Not FPR-10)

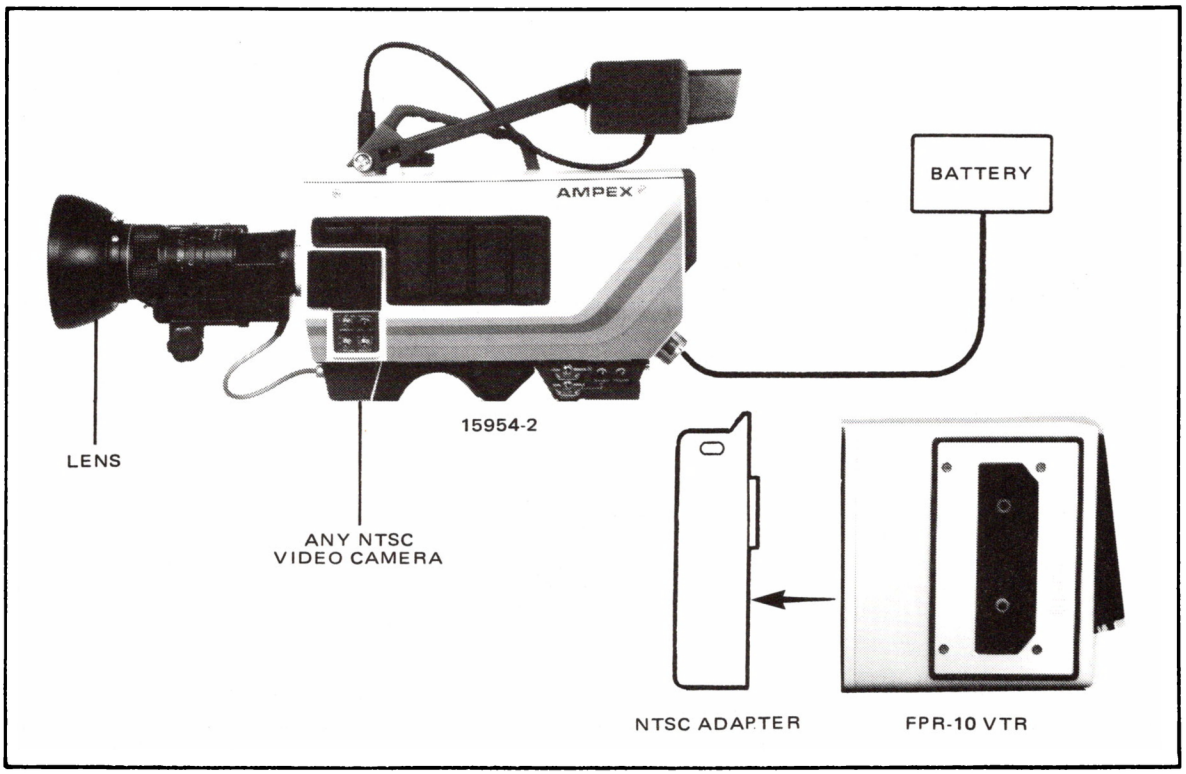


Figure 1-7. FPR-10 Portable VTR With Portable Camera (Not FPC-10)

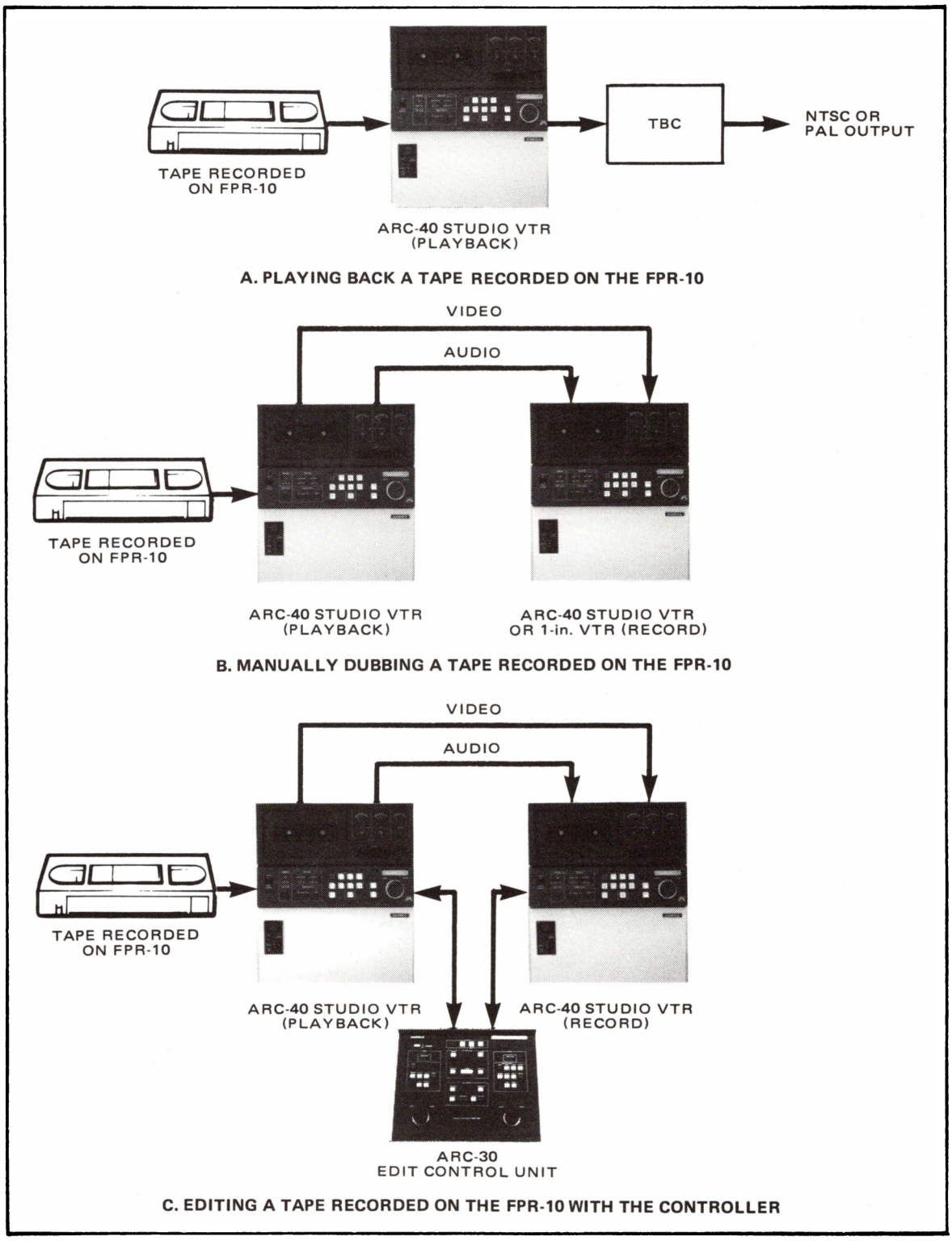


Figure 1-8. Playback, Dubbing, and Editing System for Tapes Prerecorded on ARC-10 Portable Recorder/Camera System

SECTION 2
INSTALLATION

2-1 INTRODUCTION

This section provides unpacking, inspection, and system interconnection information.

2-2 UNPACKING AND INSPECTION

The ARC-10 is shipped in a specially constructed packing case. Use care in unpacking the camera system equipment, and inspect each assembly for damage that may have occurred in transit. Check each item received against the packing list to make sure the shipment is complete. Remove all discardable internal and external packing material, being careful not to misplace any separate packages, documentation, spare parts kits, etc. Notify both the carrier and the nearest Ampex representative of any shortages or damages upon receipt of shipment.

2-3 ARC-10 CAMERA, RECORDER, VIEWFINDER, AND LENS INTERCONNECTION

2-4 Assembling the Camera/Recorder Combination

Assembling the camera/recorder combination requires that the VTR mount base first be removed from the camera, then the mount base fastened to the VTR, and then the VTR (with mount base) connected to the camera.

Remove the VTR mount base from the camera as follows:

STEP 1 Loosen camera/VTR anchoring knob (see Figure 2-1).

STEP 2 Remove VTR mount base from camera by tilting the bottom portion in the direction shown by the arrow in Figure 2-1.

Attach the VTR mount base to the VTR as follows:

STEP 1 Locate the VTR mount base and a small bag containing five screws.

STEP 2 Align the interface connectors of the VTR and VTR mount base and join them together (see Figure 2-2).

STEP 3 Tighten the five screws using a screwdriver. Tighten screws with uniform torque.

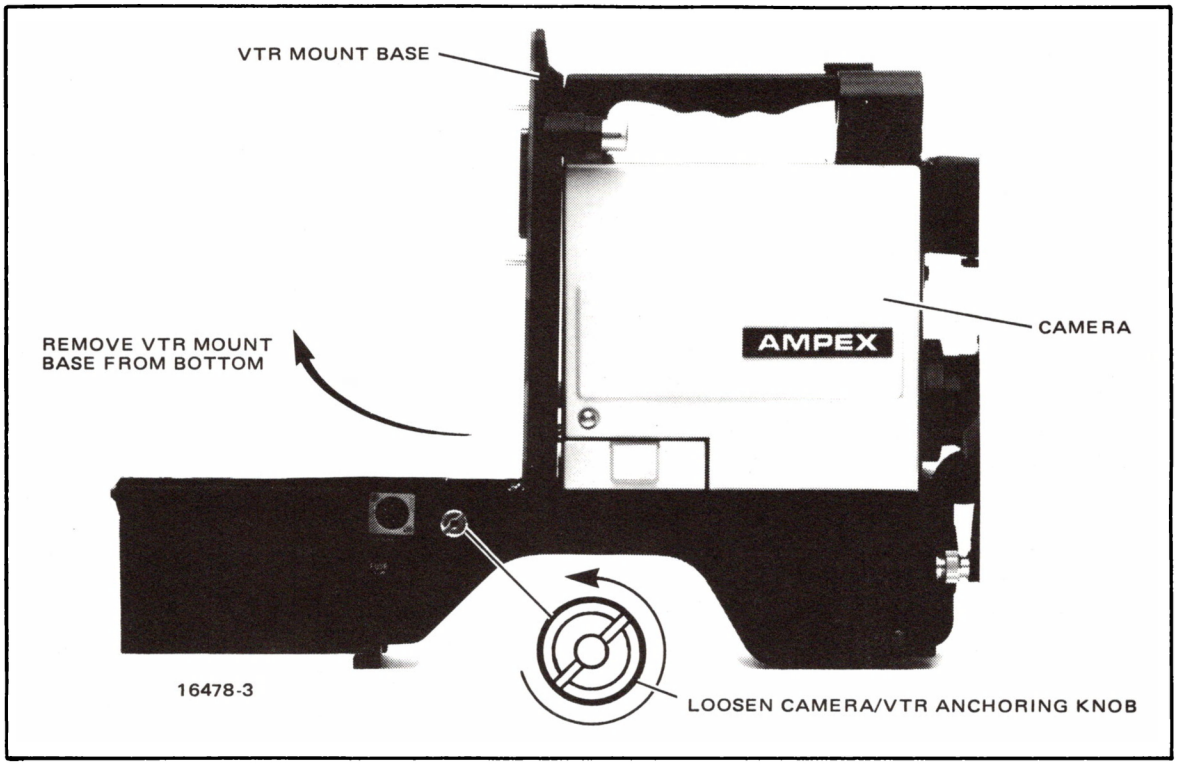


Figure 2-1. Removing VTR Mount Base from Camera

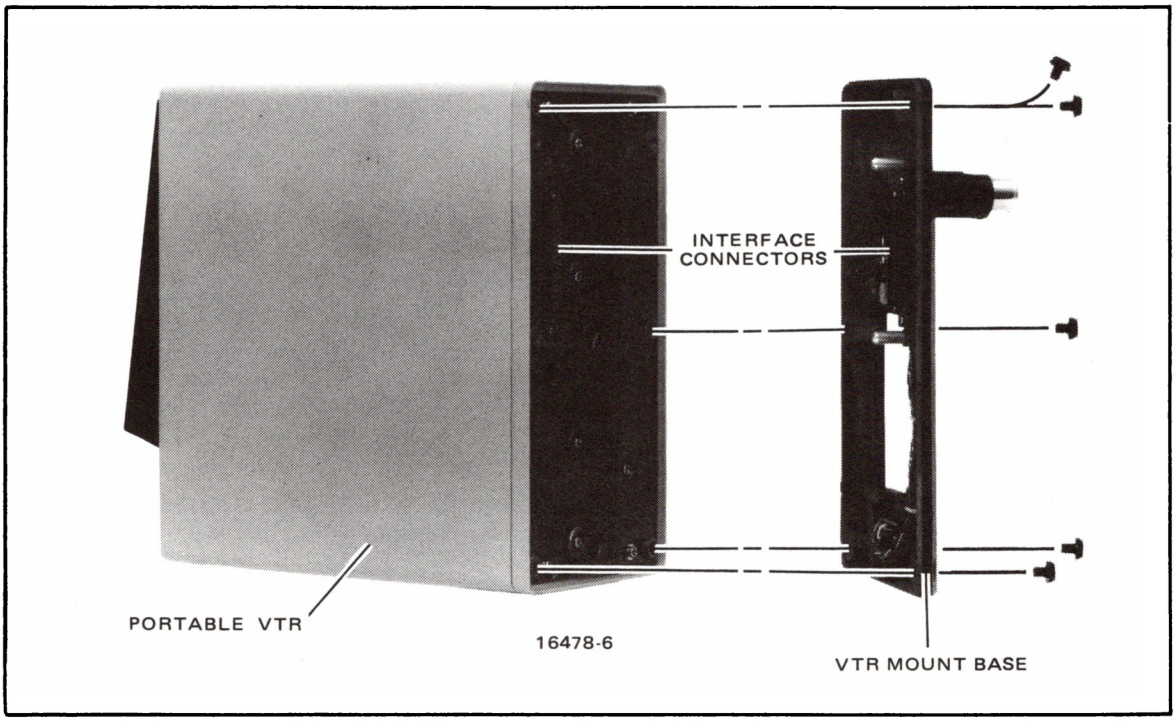


Figure 2-2. Attaching VTR Mount Base to Portable VTR

Attach VTR to the camera as follows:

STEP 1 Align mount base section of the VTR with the rear part of camera grip and pull down so that entire VTR is rotated.

STEP 2 Tighten camera/VTR anchoring knob (see Figure 2-3).

STEP 3 To remove the VTR, loosen anchoring knob, pull toward you, and separate the VTR from the camera (if microphone is installed, remove cable first).

Mount the 1.5-in. viewfinder to the camera as follows:

STEP 1 Position viewfinder relative to the camera as shown in Figure 2-4.

STEP 2 Mate the viewfinder connector to the connector on the camera. Ensure that the mounting tongue (see Figure 2-4) slides into the slot provided in the base of the handle.

STEP 3 Insert a screwdriver into the hole provided in the camera's handle and fasten the screw.

STEP 4 Fasten the screw on the bottom of the viewfinder.

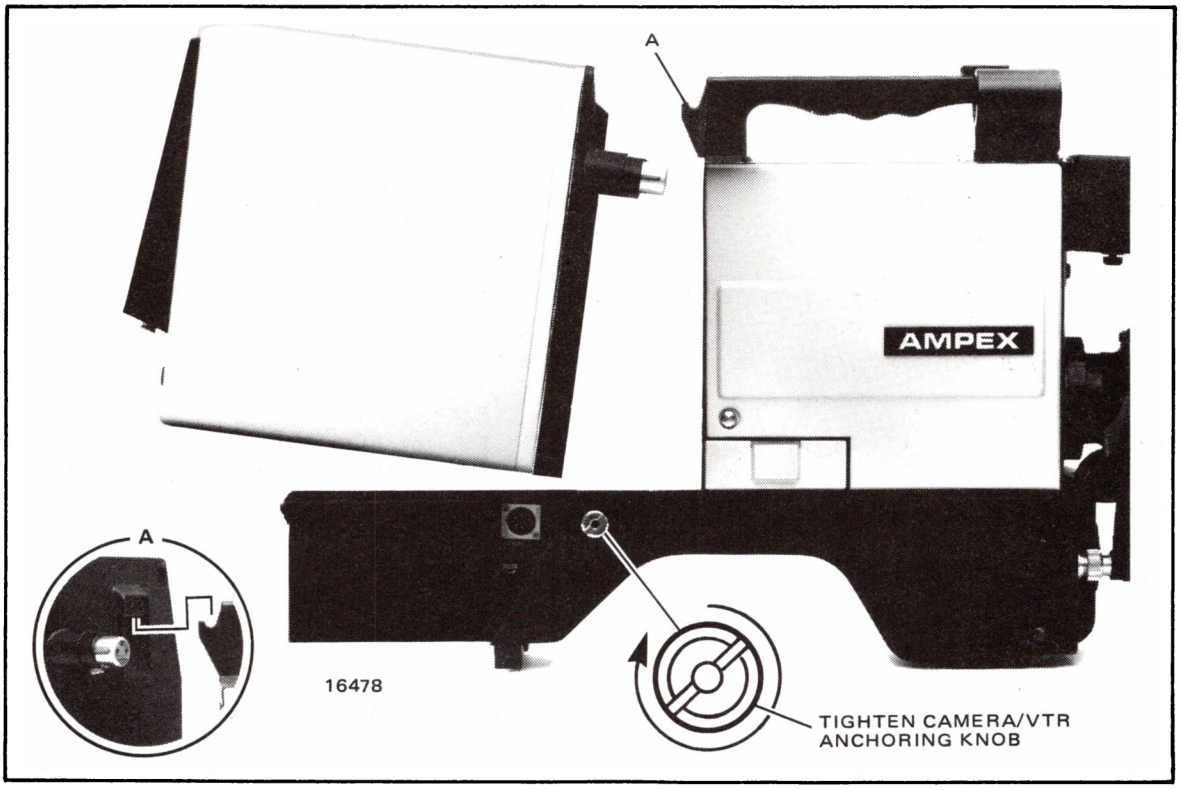


Figure 2-3. Attaching VTR Mount Base to VTR

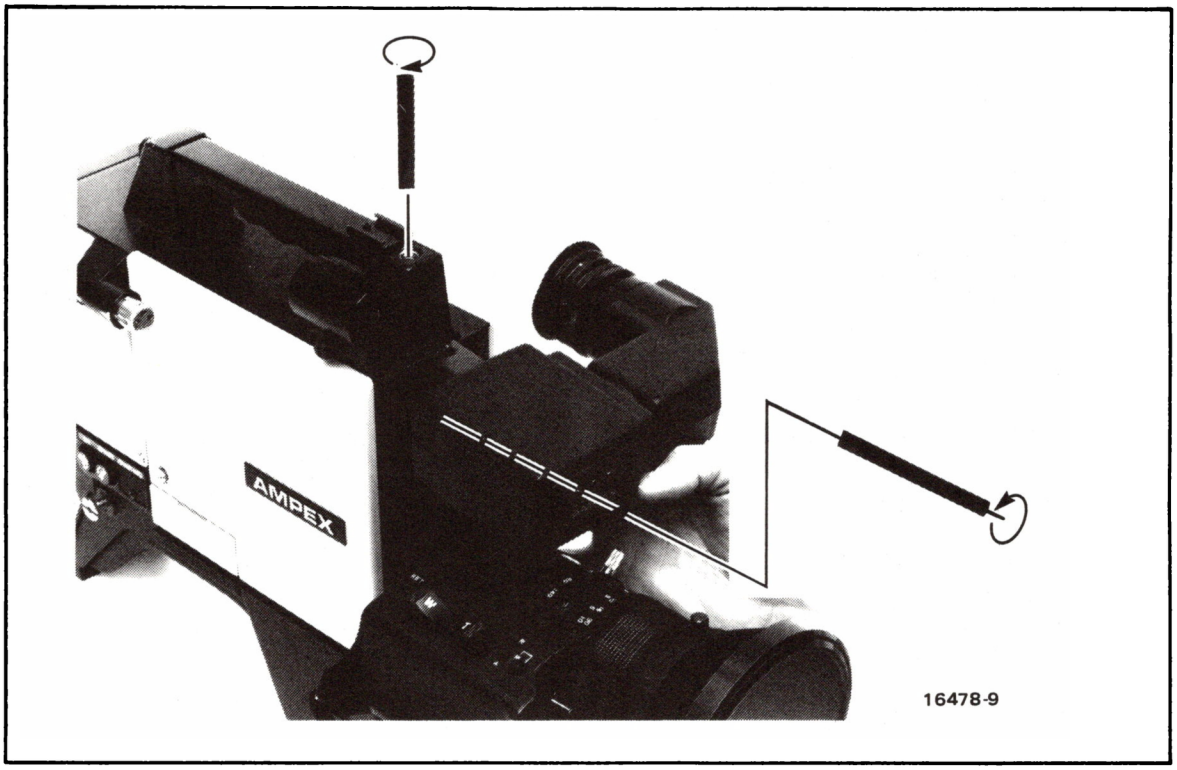


Figure 2-4. Mounting Viewfinder to Camera

Mount lens to the camera as follows:

STEP 1 Rotate lens lock knob counterclockwise and remove the cap.

STEP 2 Mount lens onto the camera's bayonet mount and rotate the lens lock knob clockwise to tighten it.

STEP 3 Connect lens connector to the camera securely.

2-5 Power Supply Connection

Use optional battery or ac adapter for supplying power to the ARC-10. Before using the battery, check its condition using battery indicator inside the camera's viewfinder; or check its condition using optional battery charger. Recharge if necessary.

Connect battery as follows:

STEP 1 Align banana plug on battery bracket with socket on battery. See Figure 2-5.

STEP 2 Push rear part of battery into bracket; it should click into position.

STEP 3 Set camera's BATT/EXT power selector switch to BATT when supplying power from the battery.

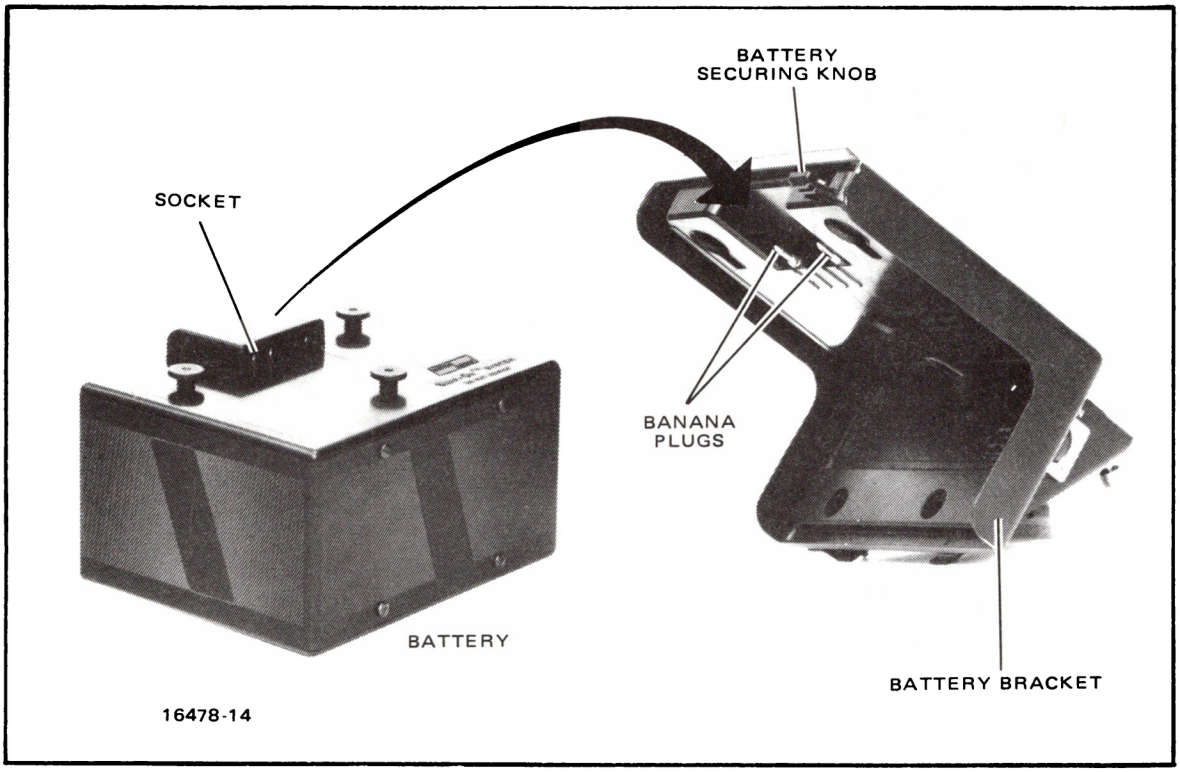


Figure 2-5. Battery Connection

STEP 4 To remove battery, push up camera's battery securing knob and, at the same time, pull battery toward rear.

Connect ac adapter as follows:

STEP 1 Connect ac adapter's dc cord to external power connector on right side of camera.

STEP 2 Connect ac adapter's ac power cord to 120 Vac outlet.

STEP 3 Set camera's BATT/EXT power selector switch to EXT when supplying power from the ac adapter.

2-6 INTERFACE CONNECTOR

Figure 2-6 shows the location and pin numbers of the interface connector that connects the camera and VTR electrical signals. Signal and pin assignments are given in Table 2-1.

2-7 VIDEO ADAPTER CONNECTION TO VTR

Connect the FPR-10 VTR to the NTSC video adapter as follows:

STEP 1 Fasten the FPR-10 VTR to the NTSC video adapter using the four accessory screws. See Figure 2-7.

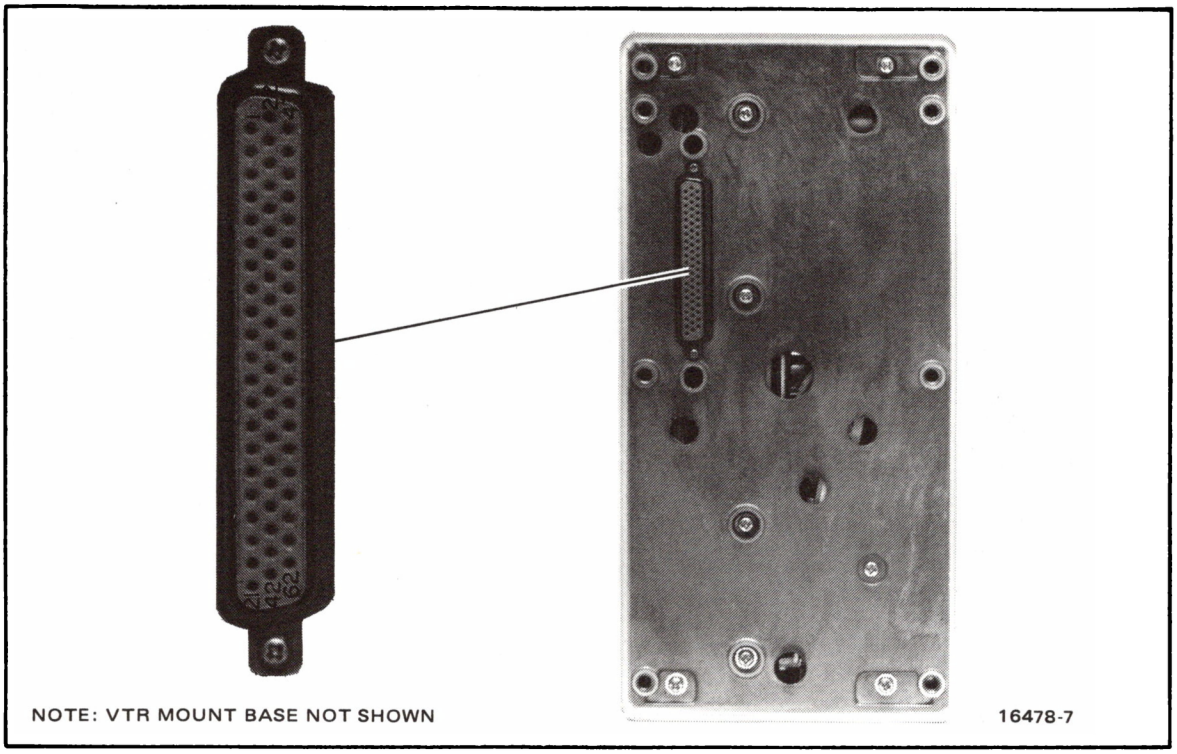


Figure 2-6. Interface Connector

Table 2-1. Interface Connector Pin Assignments

Pin	Description	Pin	Description
12	COMPOSITE VIDEO	47	JUMPER
33	COMPOSITE VIDEO GND	53	CH1 AUDIO LEVEL
55	"Y" IN	51	CH1 CONTROL ARM
56	"Y" GND	54	AUDIO GND
26	"Q" IN	32	CH2 AUDIO LEVEL
27	"Q" GND	11	CH2 CONTROL ARM
28	"I" IN	19	VTR GND (13, 60, 61, 62)
29	"I" GND	17	CH1 MONITOR
13	REC COMMAND	30	CH2 MONITOR
62	VTR WARNING	2	POWER +12V
61	VTR TAPE END	5	POWER GND
60	VTR VERIFICATION	31	POWER +12V
34	JUMPER	4	TC GENERATOR POWER

Note

Pins not listed are unused. Since they are provided for use in conjunction with other adapters, they should not be used for other purposes.

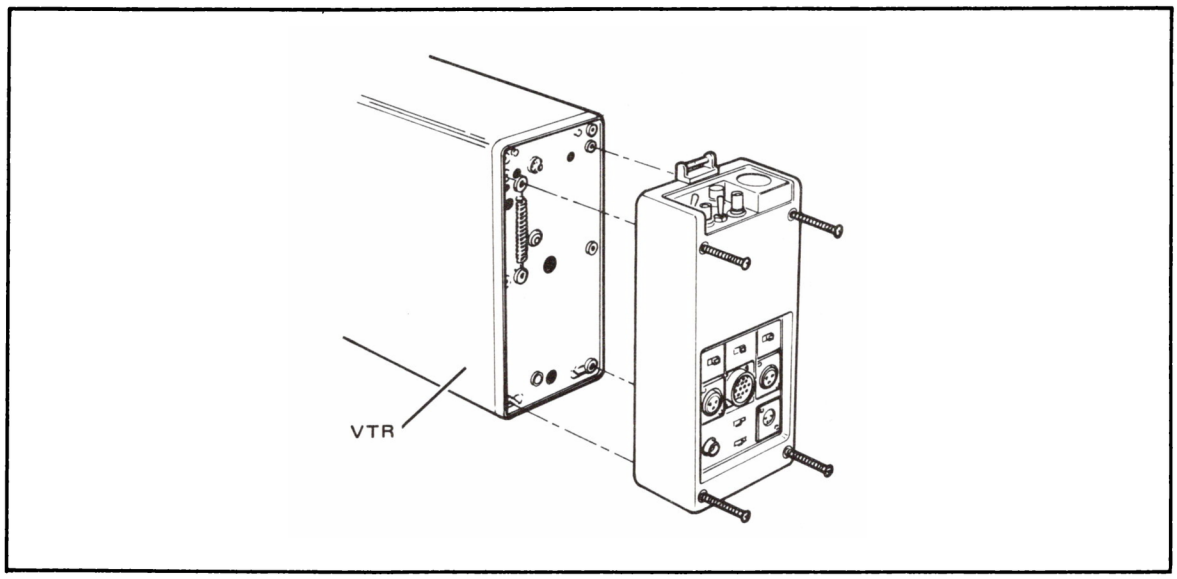


Figure 2-7. Attaching Video Adapter to VTR

STEP 2 Connect camera to the NTSC video adapter by either of two means as follows:

Note

Do not connect the NTSC and Y/C signals at the same time.

a. Using camera 26-pin connector, set video adapter's INPUT SELECT switch to CAM and connect camera to the video adapter's multi-pin connector. Depending on the type of camera used, set the video adapter's CAMERA switch to COMP VIDEO, YC, or YIQ.

b. Using the camera VIDEO OUT BNC connector, set video adapter's INPUT SELECT switch to LINE and connect video camera.

STEP 3 When connecting a microphone, set the AUDIO switch to MIC. Input level is -60 dBm (typical). Set AUDIO switch to LINE when connecting a line source or other high-level component. The input level is 4 dBm (typical). Set AUDIO switch to CAM when using the camera microphone and connecting the camera cable. (This selection applies to AUDIO CH1 only.)

2-8 Video Adapter/VTR Shoulder Strap

Connect shoulder strap as follows:

STEP 1 Attach strap mount fixture to VTR. See Figure 2-8.

STEP 2 Attach strap fixtures. Slide up fixtures as shown in Figure 2-9 and then attach the strap fixtures to the mount fixtures on the VTR and the video adapter.

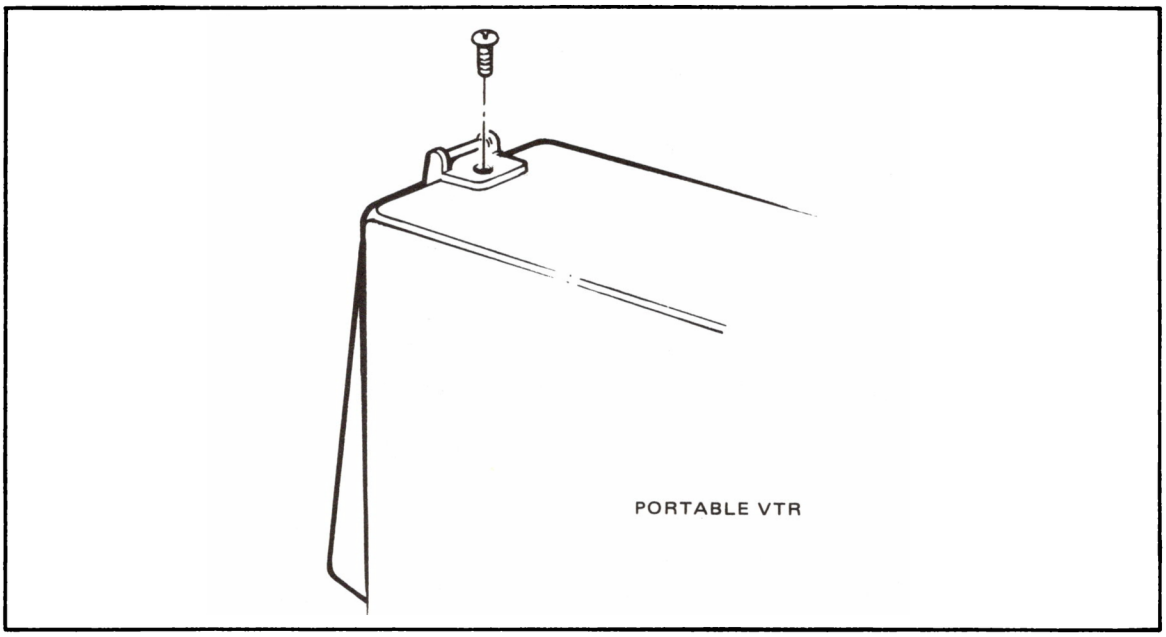


Figure 2-8. Attaching Strap Mount Fixture to VTR

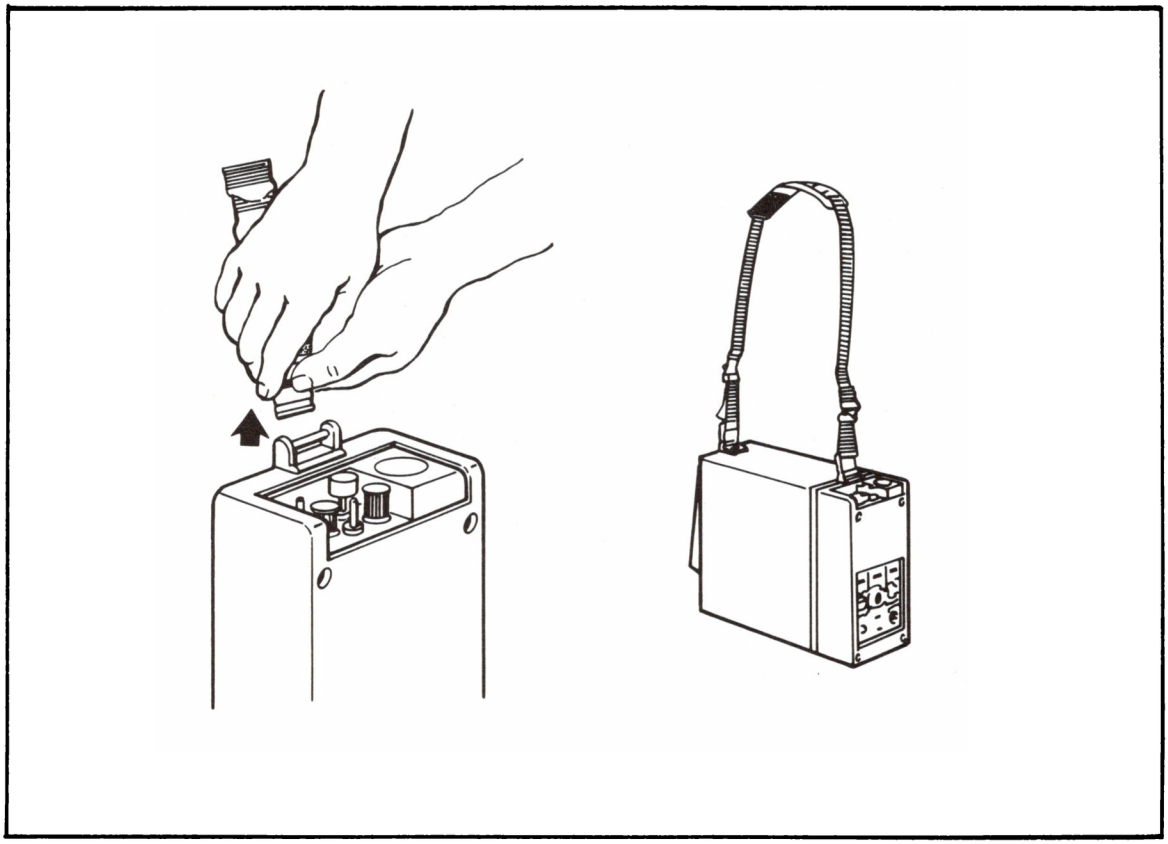


Figure 2-9. Attaching Strap Fixtures to Strap Mount Fixtures

SECTION 3
OPERATION

3-1 INTRODUCTION

This section describes controls and indicators of the ARC-10 Portable Recorder/Camera including the 1.5-in. viewfinder. Controls on a typical zoom lens are also described. Operational procedures, operational checks, preference adjustments, and brief camera setup procedures that can be done by the operator as the need arises are included here. Detailed camera setup procedures that must be performed periodically are provided in Section 5, *Maintenance*.

3-2 CAMERA CONTROLS AND INDICATORS

Camera controls and indicators are described in Table 3-1.

3-3 VTR CONTROLS AND INDICATORS

VTR controls and indicators are described in Table 3-2.

3-4 LENS CONTROLS

Controls provided on a typical lens are described in Table 3-3.

3-5 1.5-IN. VIEWFINDER CONTROLS

Controls provided on the 1.5-in. viewfinder are described in Table 3-4. Viewfinder indicators are shown in Figure 3-1.

3-6 NTSC VIDEO ADAPTER CONTROLS AND INDICATORS

Controls and indicators provided on the optional NTSC video adapter are described in Tables 3-5 through 3-7.

3-7 OPERATOR PRECAUTIONS

The following precautions must be observed when handling the ARC-10 Portable Camera/Recorder:

- Do not point the camera at the sun. Picture sticking can result when the camera is used to shoot the sun or an extremely bright object. This is especially true if Saticon pickup tubes are used in the camera. There is also a possibility that picture sticking will result even after the camera's power is turned off. Consequently, the filter should be set to the "close" position first and then the camera's power should be turned off to ensure that the lens is capped.

- Avoid temperature extremes. The camera is designed to operate over a temperature range of 0°C to +40°C. If it is used at higher temperatures or left exposed to high temperatures, permanent marks may appear on the screen which you may not be able to remove. When the camera is used below 0°C, protect it from the cold. Dimensional changes resulting from low temperatures can degrade mechanical performance.
- Do not leave the camera in a passenger car or other vehicle if the temperature will rise above +40°C.
- Avoid moisture. Do not use the camera in rain or high levels of humidity. Dew may form inside the unit which could cause malfunctions.
- Avoid dust. Avoid using camera in a dusty environment. Dust may penetrate inside and impair performance of the optical system.
- Handle carefully. Do not drop the camera or subject it to strong shocks.

3-8 ARC-10 OPERATIONAL PROCEDURES

3-9 Power Turn-On Procedure

Turn on the ARC-10 power as follows:

STEP 1 Set CAM+VTR/CAM/OFF switch to OFF.

STEP 2 Set BATT/EXT switch to the position that corresponds to the power source in use. Set to BATT if the source is to be the battery pack. Set to EXT if a suitable external supply has been connected.

STEP 3 Set CAM+VTR/CAM/OFF switch to the CAM position.

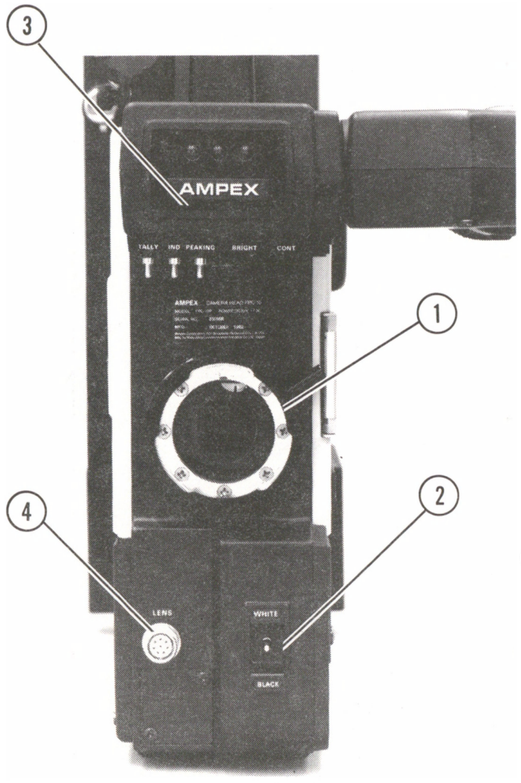
3-10 Selecting Lens Filters

Set the lens filters as appropriate for the lighting conditions. The filter specifications are given below.

Saticon CC* & ND**		ND**		Plumbicon CC*	
Setting	**Temperature**	**Setting**	**Value**	**Setting**	**Temperature**
0	CLOSE	1	100%	A	3200°K
1	3200°K	2	25%	B	4700°K
2	4700°K	3	6.5%	C	5600°K
3	5600°K+1/4ND	4	CLOSE	D	7500°K

* CC (Color temperature conversion) filter usage:
3200°K—tungsten, halogen, or studio lighting
4700°K—Fluorescent lighting
5600°K—Normal daylight
7500°K—Cloudy daylight and morning/evening

**ND (Neutral Density) filter usage: Neutral density filters can be used effectively under conditions of strong illumination and when narrower depths of field are desired. During normal conditions use 100% filter; No. 1 on Plumbicon camera version.



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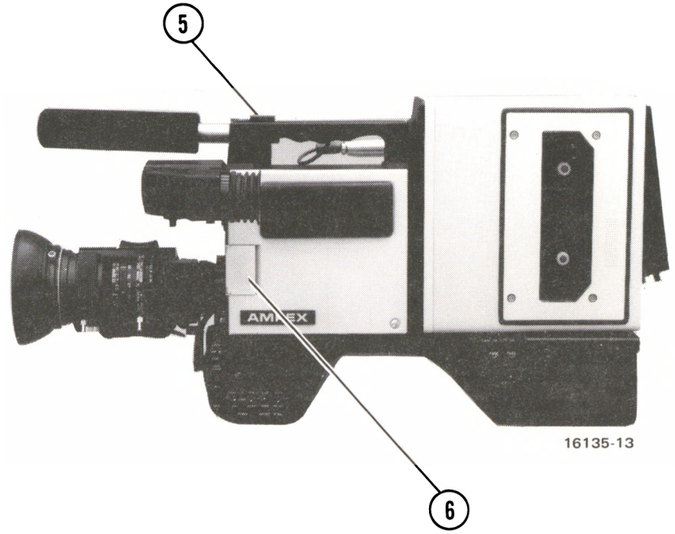

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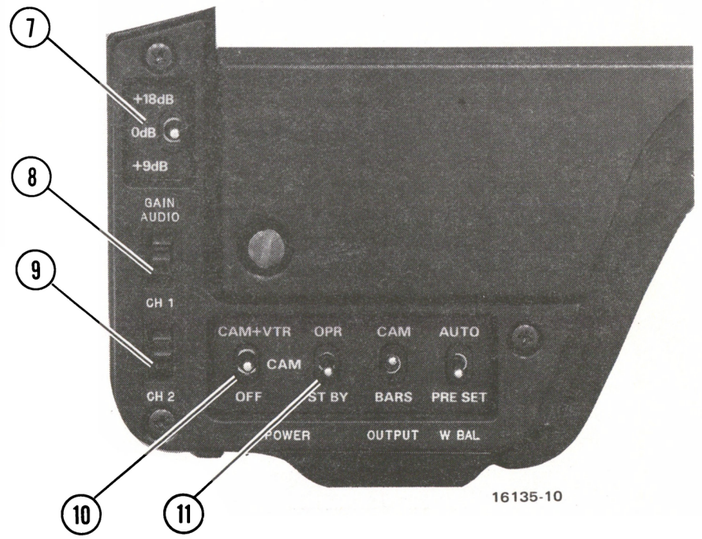

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Table 3-1. Camera Controls, Indicators, and Connectors

Index No.	Name	Description
1	Lens mount	Bayonet mount; lens can be attached and removed in a single twist operation.
2	Auto WHITE/BLACK switch	Initiates automatic white and automatic black balancing. When operating this switch, set lens iris select switch located on lens to AUTO and set camera's W BAL PRESET/AUTO switch to AUTO. WHITE setting initiates white balance; BLACK setting initiates black balance.
3	Viewfinder connector (hidden)	Electrically connects viewfinder to camera.
4	Lens connector	Electrically connects lens to camera.
5	Accessory shoe	Provides mounting for lights.
6	Filter compartment	Filters are changed by rotating from top to bottom or bottom to top. Rotate to the clickstop position.
7	+18 dB/0 dB/+9 dB gain switch	Increases camera's sensitivity by +18 dB, 0 dB or + 9 dB.
8	AUDIO GAIN CH 1 control	Controls channel 1 (microphone with input connector on camera) audio level.
9	AUDIO GAIN CH 2 control	Controls channel 2 (microphone with input connector on VTR) audio level.
10	CAM+VTR/CAM/OFF power switch	Turns camera/VTR power on or off. If lens iris select switch is in AUTO position after power has been switched off, power is still supplied to lens allowing iris to close automatically.
11	OPR/STBY (operate standby) switch	When set to STBY, power is turned off except pickup tube heater is kept on; this conserves power and minimizes warmup time after switch is set to OPR.

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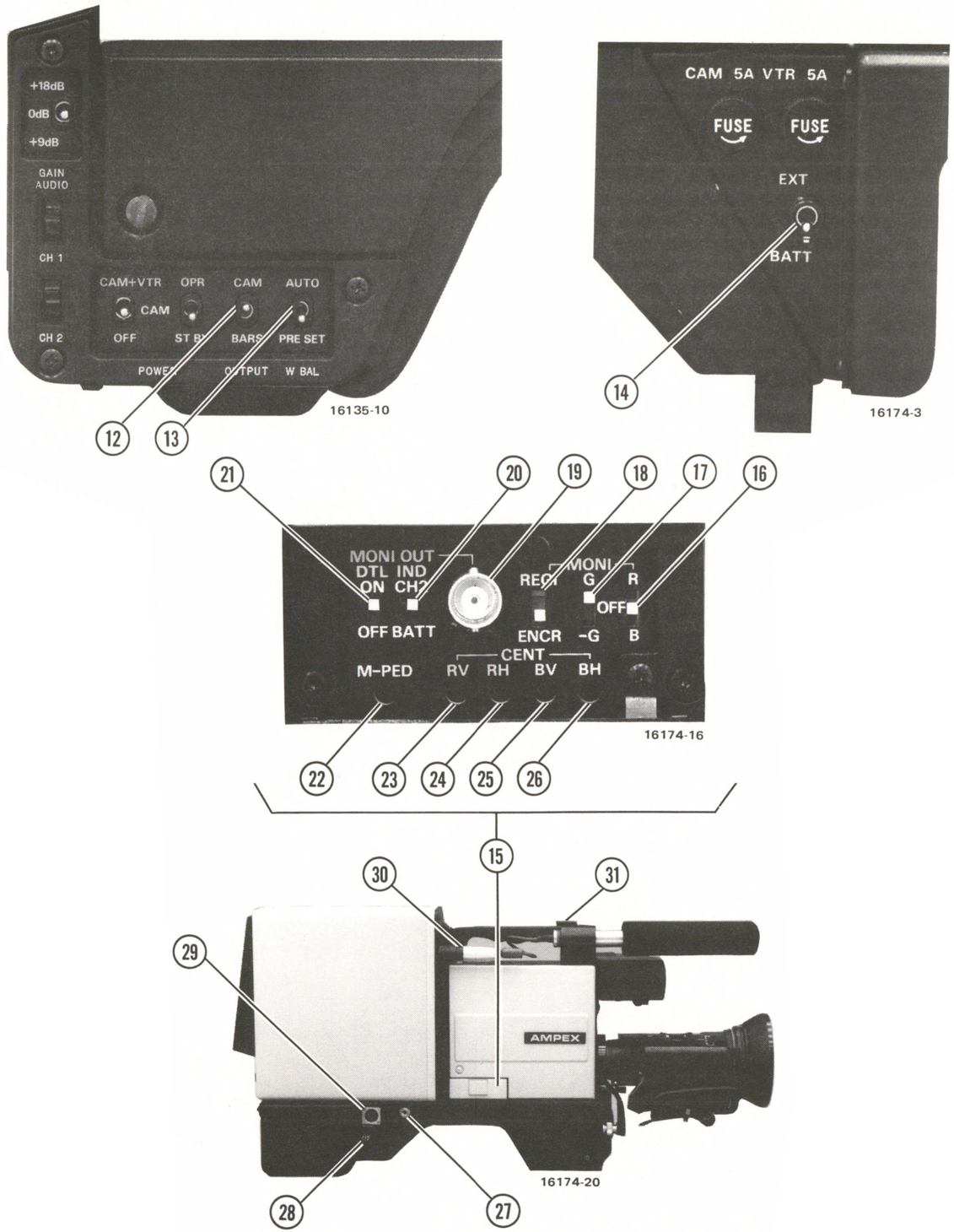


Table 3-1. Camera Controls, Indicators, and Connectors (Continued)

Index No.	Name	Description
12	CAM/BARS/OUTPUT switch	Selects pickup-tube-generated video or color bar signal. A camera number identification signal can be inserted into the color bar signal; when recorded at the beginning of tapes this identifies the camera used to shoot the material.
13	W BAL AUTO/PRE-SET switch	PRESET position sets white balance for 3200° K; use when there is not enough time for automatic white balance procedures. Use color filter to compensate when lighting is other than 3200° K.
14	BATT/EXT switch	Selects battery or external power supply. If power is turned off using this switch (as in selecting an external power source that is not connected) the lens iris will not be automatically set to the closed position.
15	Setup panel	Switches, controls, and connectors required for camera setup are housed under this cover.
16	R/OFF/B switch	Routes R (red) or B (blue) signals to monitor output connector for camera setup when REGI/ENCR switch is in the REGI position. In OFF position neither R nor B is selected.
17	G/OFF/-G switch	Routes G or -G signals to monitor output connector for camera setup when REGI/ENCR switch is in REGI position. In OFF position neither G or -G is selected.
18	REGI/ENCR switch	When set to REGI, video signals selected by index nos. 16 and 17 are routed to monitor output. When set to ENCR, encoded video is routed to monitor output connector and luminance signal with level indicator superimposed is available in viewfinder. Always set switch to ENCR after completion of registration adjustments.

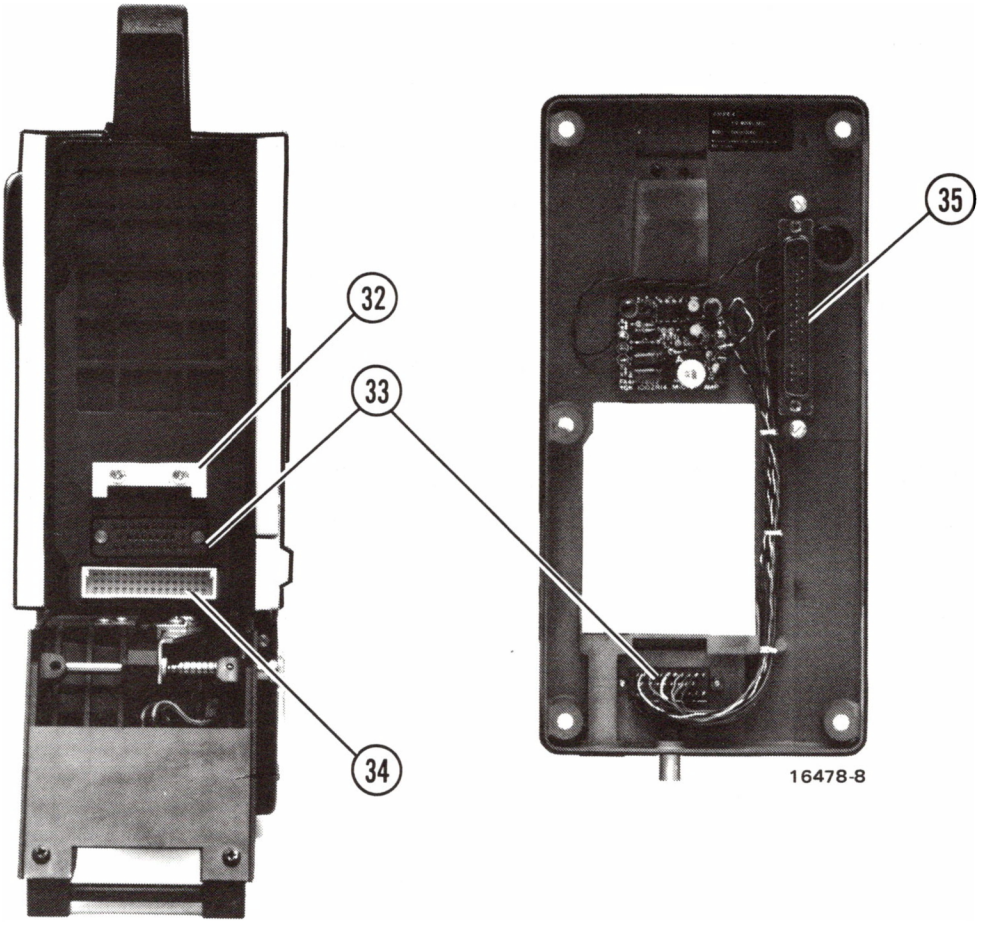
(Continued next page)

Table 3-1. Camera Controls, Indicators, and Connectors (Continued)

Index No.	Name	Description
19	MONI OUT connector	Used for connecting an external video monitor. Video signal selected by index nos. 16, 17, and 18 is displayed.
20	IND CH2/BATT	Depending on position of switch, lowermost horizontal indicator bar in viewfinder will indicate either battery voltage or channel 2 audio levels. When set to CH2, length of bar indicates channel 2 audio level. When set to BATT, length of bar indicates battery voltage.
21	DTL ON/OFF switch	Switches contour signal on and off. Unless required, this switch should be kept set to ON. Set to OFF during registration adjustments.
22	M-PED master pedestal control	Adjusts pedestal level equally in red, green, and blue channels.
23	CENT R-V control	Adjusts red vertical centering.
24	CENT R-H control	Adjusts red horizontal centering.
25	CENT B-V control	Adjusts blue vertical centering.
26	CENT B-H control	Adjusts blue horizontal centering.
27	Camera/VTR anchoring knob	Fastens VTR to camera body.
28	SPARE fuse holder	Spare 5A fuse is contained here.
29	DC IN connector	Used to supply power to camera and connector VTR from an external supply.
30	Mic input connector	Signals from this input are recorded on audio channel 1.
31	Microphone holder	Clamps microphone to camera.

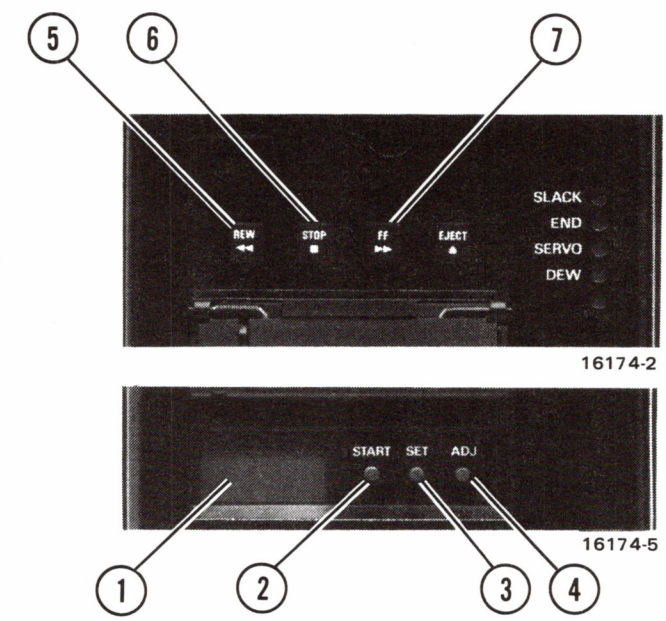
(Continued next page)

Table 3-1. Camera Controls, Indicators, and Connectors (Continued)



Index No.	Name	Description
32	Power input connector	Power from external source is supplied through this connector.
33	VTR connector	Camera/VTR interconnect signals routed through this connector.
34	GL (genlock) adapter connector	Signals are transferred through this connector to genlock adapter when used.
35	Interface connector	Interface connector for mating VTR.

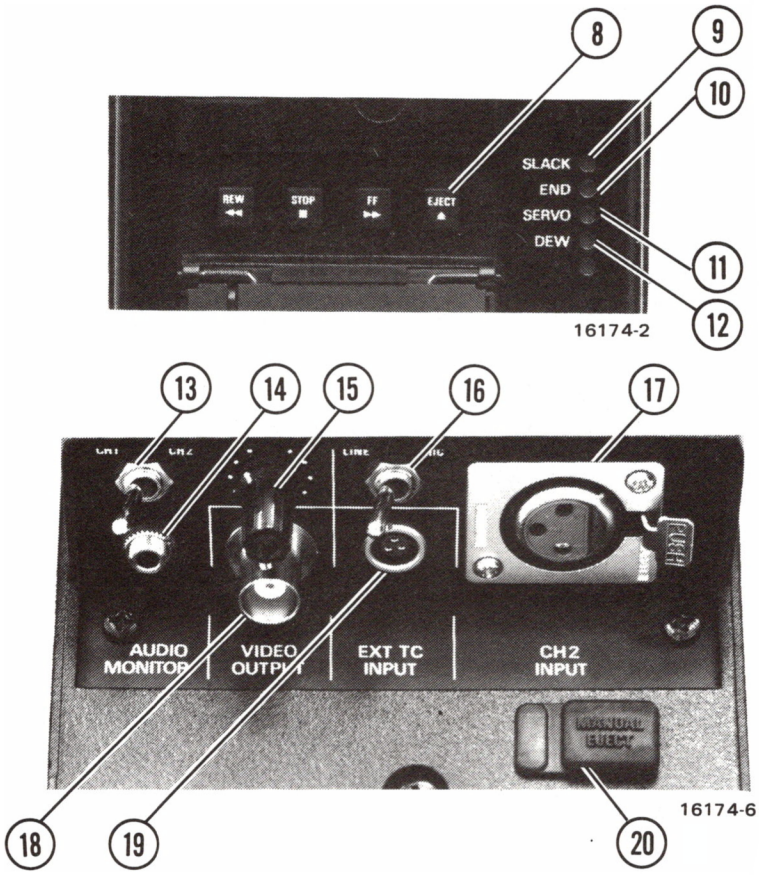
Table 3-2. VTR Controls, Indicators, and Connectors



Index No.	Name	Description
1	Time Code Generator Display	Displays time code.
2	START button	Starts time code time.
3	SET button	Adjusts hours and minutes of time code. When ADJ and SET buttons are pressed together, generator display is reset to 000000.
4	ADJ button	Selects hours and minutes when time code is set.
5	REW button	When pressed, tape rewinds.
6	STOP button	When pressed, stops fast forward or rewind operation. When pressed during standby mode, tape is unloaded and VTR is set to stop mode.
7	FF button	When pressed, moves tape fast forward. Note: On machines with viewfinder playback kit installed, press STOP and FF simultaneously to select play mode.

(Continued next page)

Table 3-2. VTR Controls, Indicators, and Connectors (Continued)



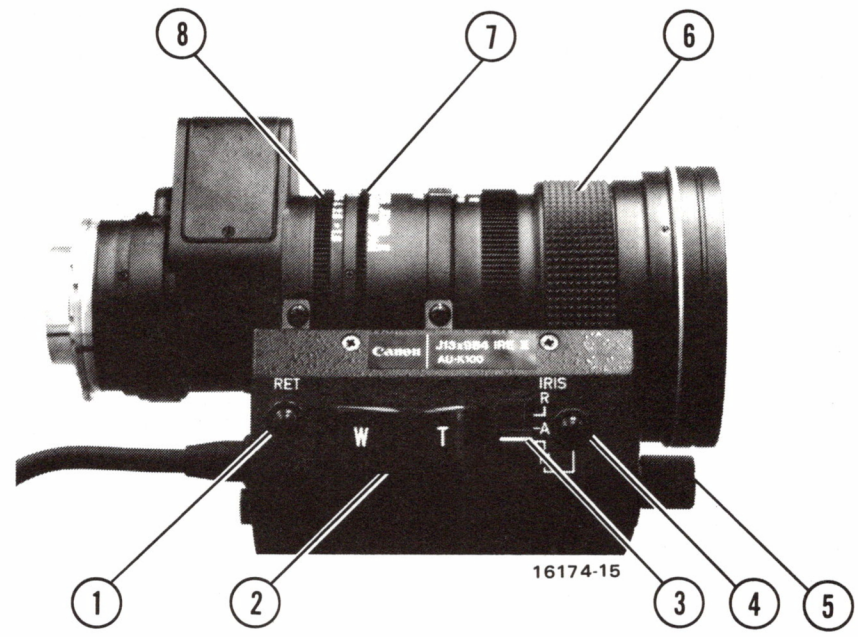
Index No.	Name	Description
8	EJECT button	When pressed, tape is ejected from cassette holder.
9	SLACK LED	Lights if there is something wrong in the tape path and when drum has stopped rotating.
10	END LED	Blinks when there is less than one minute of tape left; lights when tape is at end.
11	SERVO LED	Lights when drum or capstan servo are not locked.
12	DEW LED	Lights when dew has formed inside the portable VTR.

(Continued next page)

Table 3-2. VTR Controls, Indicators, and Connectors (Continued)

Index No.	Name	Description
13	AUDIO MONITOR CH1/CH2 switch	Audio channel 1 or channel 2 for monitoring.
14	AUDIO MONITOR jack	Connect earphone to monitor sound.
15	AUDIO MONITOR LEVEL control	Adjusts level of monitored sound.
16	LINE/MIC switch	Set to position corresponding to equipment connected to CH 2 INPUT connector. LINE: 4 dBm reference level. Used when recording a line connected to sound source. MIC: -60-dBm reference level. Used when recording a microphone connected to sound source.
17	CH2 INPUT connector	Input connector (XLR) used when recording sound on tape track channel 2.
18	VIDEO OUTPUT connector	Output connector (BNC) provides composite NTSC signal or color bar signal. Camera's signals can be monitored here when VTR power is switched off.
19	EXT TC INPUT connector	Input connector (LEMO) used when recording time code produced on an external time code generator.
20	MANUAL EJECT	Used to eject cassette tape manually. Remove rubber cap, insert screwdriver, and push down; cassette holder will pop out. Do not eject a tape which is threaded, since this may damage it.

Table 3-3. Lens Controls



Note

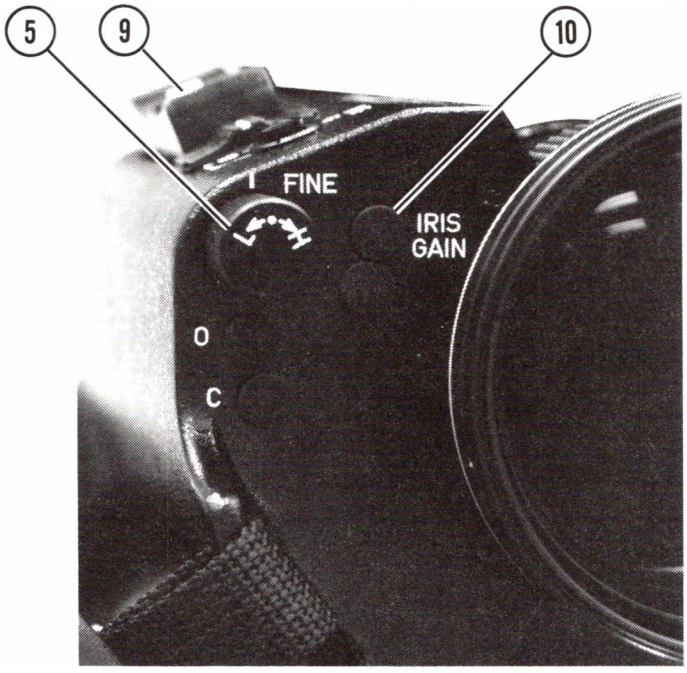
The Cannon J13x9B4IREII is used in this example.

Index No.	Name	Description
1	Return video button	If FPR-10 is equipped with viewfinder playback kit, pressing RET causes auto-backspace and replay of last 10 seconds of recording.
2	Zoom mode switch	Use to control motorized zoom between W (wide angle) and T (telephoto). Zooming is quick if pushed hard, slow if pushed gently.
3	IRIS R/A/M selector switch	M (manual): selects manual modes. A (auto): selects automatic iris mode; iris automatically adjusts for brightest object in center of picture. R (remote): set for remote control of iris.
4	Auto iris button	When IRIS R/A/M switch is set for manual mode, pressing A overrides manual mode and causes automatic iris operation. Automatic iris is in effect only while this button is pressed.

(Continued next page)

Table 3-3. Lens Controls (Continued)

Index No.	Name	Description
5	Video level control	Use to increase or decrease lens opening by one F-stop when IRIS R/A/M switch is set to A (auto) position.
6	Focus ring	Adjust focus.
7	Zoom ring	Adjust zoom.
8	Iris ring	Adjust iris opening.



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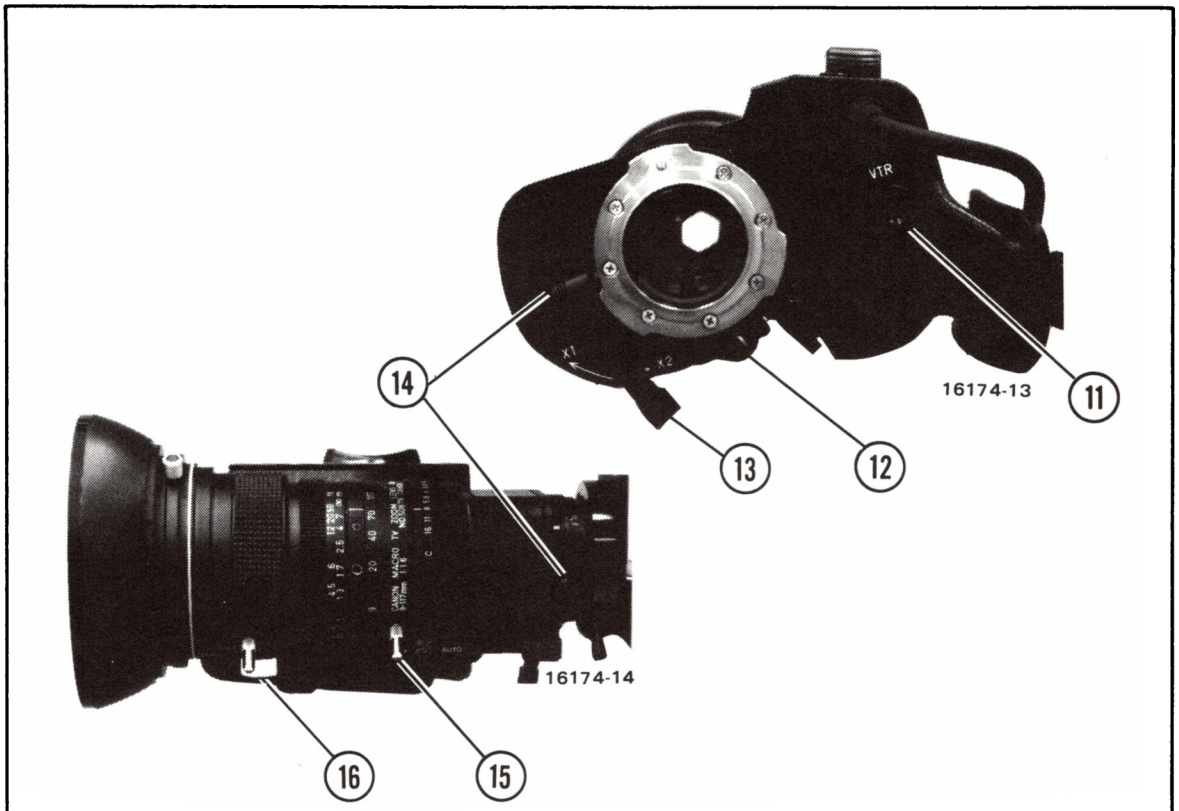
Index No.	Name	Description
9	Auto iris video control (behind cover)	Adjust gain of automatic iris response to changes in video level.
10	Iris gain control (behind cover)	Adjust gain of automatic iris control motor.

(Continued next page)

Table 3-3. Lens Controls (Continued)

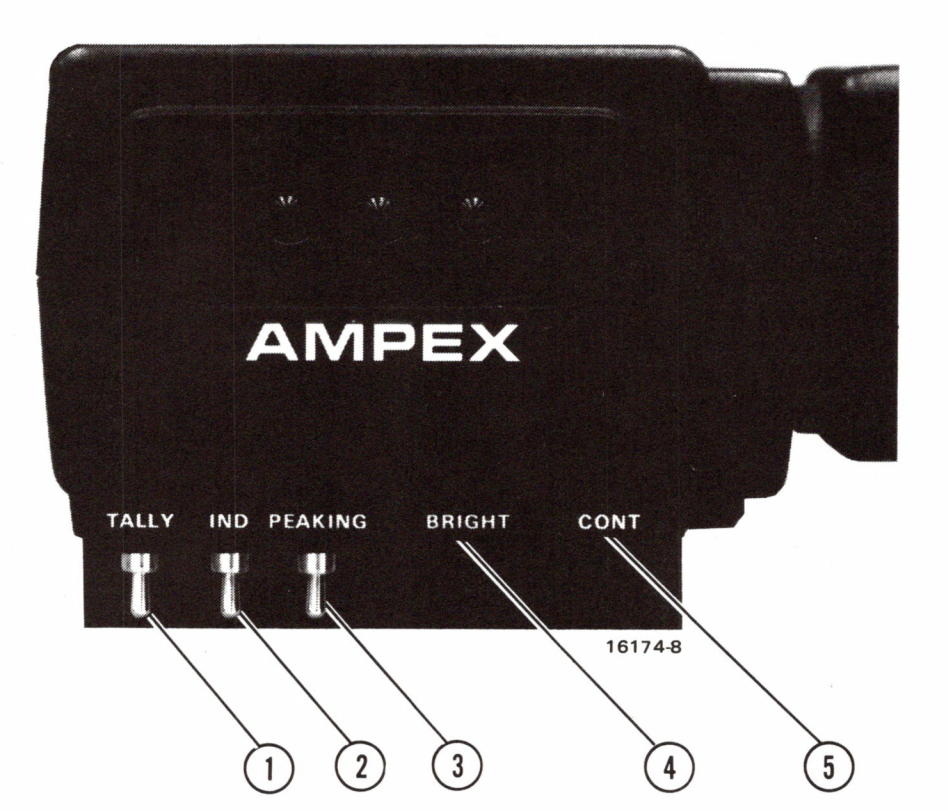


Note

The Cannon J13x9B4IREII is used in this example.

Index No.	Name	Description
11	VTR start/stop switch	Push once to start VTR, push again to stop.
12	Flangeback adjust locking screw	Locks the flangeback ring after back-focus adjustment.
13	Extender selector lever	Not used
14	Macro lever	For close ups.
15	Zoom mode selector	Selects motorized or manual zoom.
16	Zoom remote connector	Connector for remote control of zoom.

Table 3-4. 1.5-In. Viewfinder Controls and Indicators



Index No.	Name	Description
1	Talent TALLY switch	Turns talent tally light (3 LEDs on front of viewfinder) on or off.
2	IND on/off switch	Turns video/audio/battery level indicator on viewfinder screen on or off.
3	High PEAKING on/off switch	When set to ON, resolution of video signal in viewfinder is increased for easier focusing. When the switch is set to OFF, a natural video signal is produced.
4	BRIGHT control	Adjusts brightness of monitored video.
5	CONT control	Adjusts contrast of monitored video.

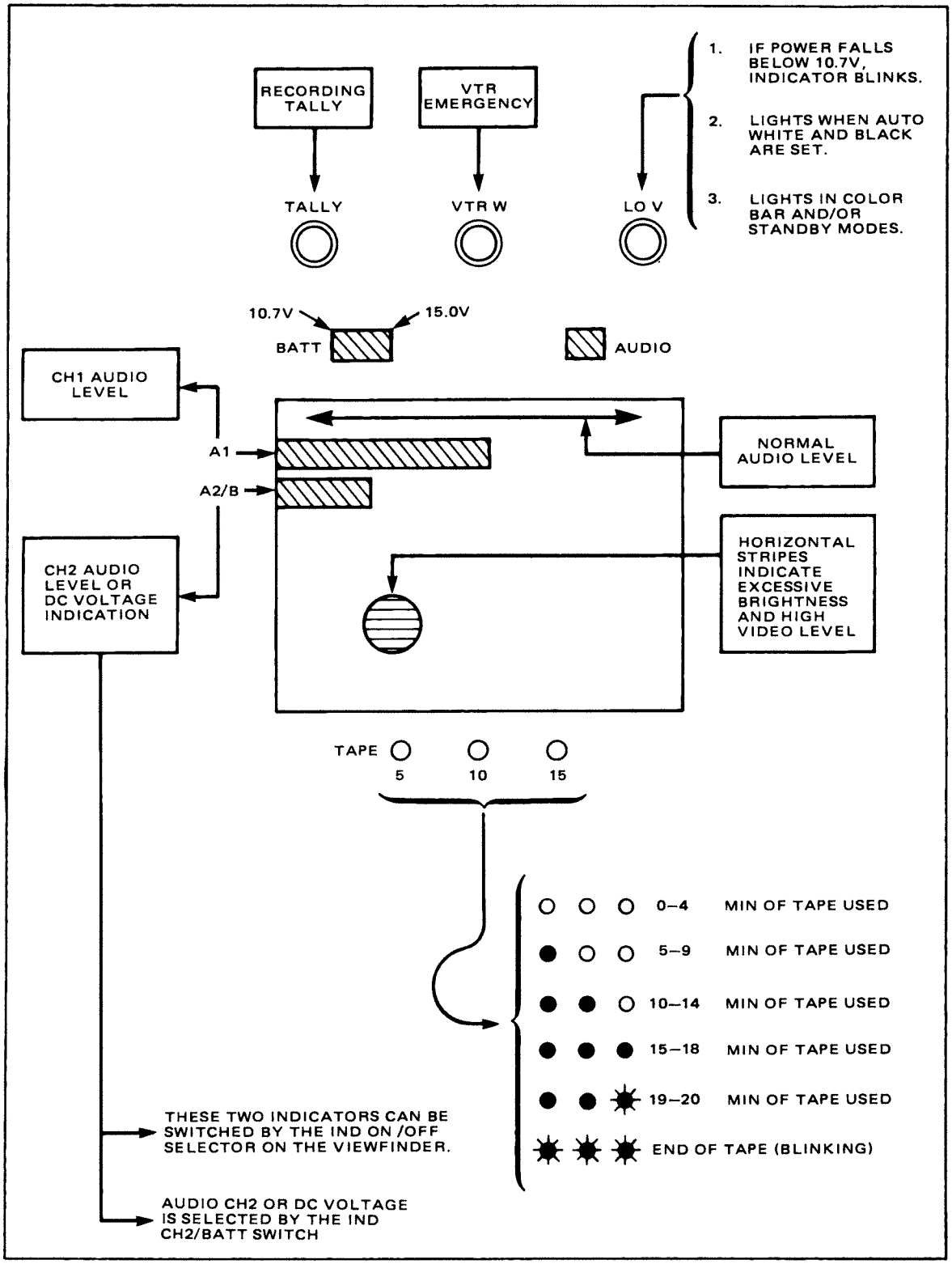
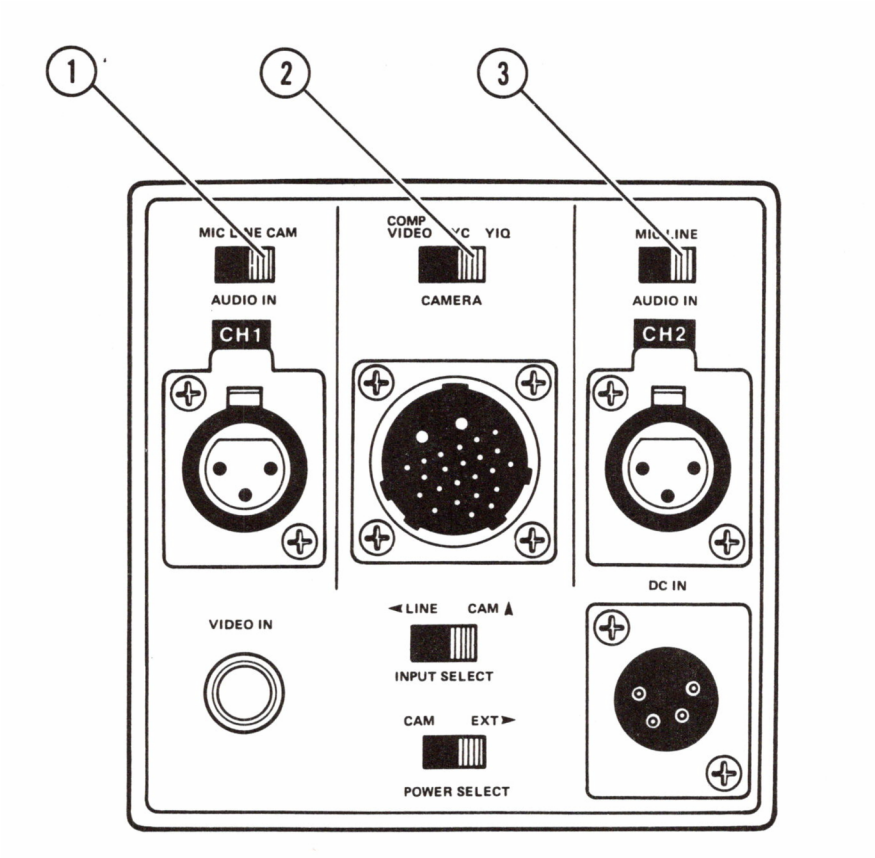


Figure 3-1. Viewfinder Indicators—As Viewed Through Viewfinder

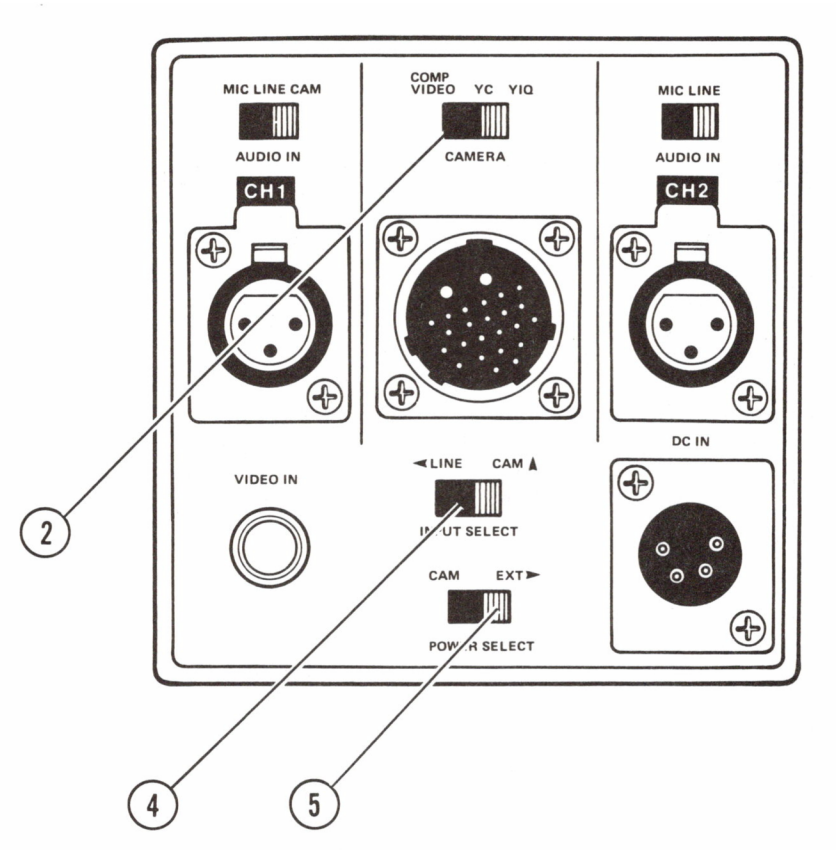
Table 3-5. NTSC Video Adapter Switches



Index No.	Switch	Position	Function
1 3	AUDIO IN	MIC	Selected when a low audio input level is used, such as from a microphone (-60 dBm).
		LINE	Selected when a high audio input level, such as that from a line, passes through internal attenuator circuit (+4 dBm).
		CAM	Selected when a high audio input level from the 26-pin connector CAMERA passes through internal attenuator circuit (-20 dBm).
2	CAMERA	COMP VIDEO	Selected when video input signal of video camera is a composite signal.

(Continued next page)

Table 3-5. NTSC Video Adapter Switches (Continued)



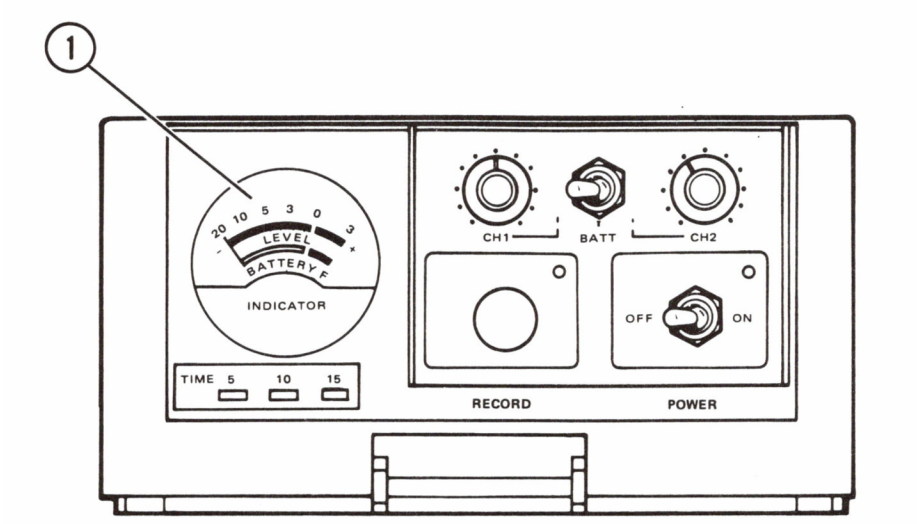
Index No.	Switch	Position	Function
2	CAMERA (Continued)	YC	Selected when video input signal of video camera is a Y/C signal.
		YIQ	Selected when video input signal of video camera is a Y/I/Q signal.
4	INPUT SELECT	LINE	Selected when VTR connector on video camera is a BNC type. Signal from VIDEO IN (BNC connector) is selected.
		CAM	Selected when VTR connector on the video camera is a 26-pin type and when connection is made with video camera using the 10p—26p conversion cable.

(Continued next page)

Table 3-5. NTSC Video Adapter Switches (Continued)

Index No.	Switch	Position	Function
5	POWER SELECT	CAM	Selected when VTR power is supplied from video camera (this applies only to video cameras with a 26-pin connector for connection with the VTR) through the 26-pin connector.
		EXT	Selected when VTR power is supplied from battery pack or ac adapter connected to DC IN (XLR, pin 4).

Table 3-6. NTSC Video Adapter Controls and Indicators



Index No.	Name	Function
1	INDICATOR	Indicates audio input level or battery capacity. Selection between the two displays is performed with the CH1/BATT/CH2 selector switch (6). Optimum audio input level is attained by adjusting indicator to near "0". Indicator is used to check battery capacity across the E (empty) to F (full) range. Keep battery charged so that indicator is within the green area (about 11V or more).

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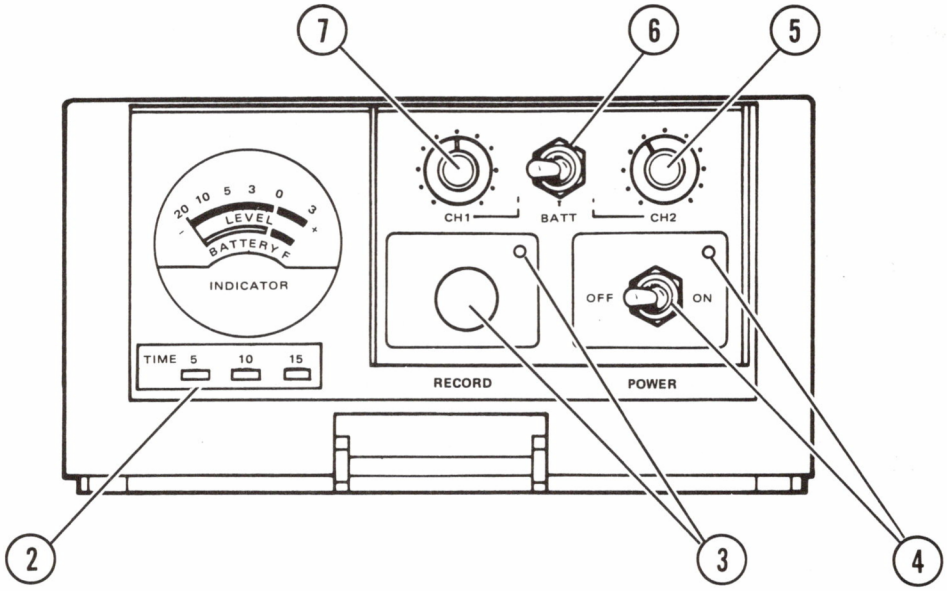
Table 3-6. NTSC Video Adapter Controls and Indicators (Continued)



Index No.	Name	Function
2	TIME lamps	Indicate how much tape has been used. (See table below.)

Time Lamps (5 10 15)	Significance
▭ ▭ ▭	0—4 minutes of tape used
■ ▭ ▭	5—9 minutes of tape used
■ ■ ▭	10—14 minutes of tape used
■ ■ ■	15—18 minutes of tape used
■ ■ ■ (flashing)	19—20 minutes of tape used
■ ■ ■ (flashing)	End of tape.

▭ = off; ■ = on; ■ (flashing) = flashing

(Continued next page)

Table 3-6. NTSC Video Adapter Controls and Indicators (Continued)

Index No.	Name	Function
3	RECORD button	Used to start VTR recording when INPUT SELECT switch is at line position. When pushed once, VTR starts recording; when pushed again, recording stops. RECORD button does not function when INPUT SELECT switch is at CAM position. RECORD LED lights only when RECORD button has been pressed and when input signals are supplied. Always check that RECORD LED has lighted when RECORD button has been pushed.
4	POWER switch	Power switch for VTR. When POWER switch has been set to ON, LED lights.
5	CH2 input level	Used to adjust the audio CH2 input level control **Note** **Input level is increased by rotating control clockwise and reduced by rotating it counterclockwise.**
6	CH1/BATT/CH2 selector switch	This switch selects the indicator display. **CH1:** Audio CH1 input level is displayed. **BATT:** Battery capacity is displayed. **CH2:** Audio CH2 input level displayed.
7	CH1 input level	Used to adjust the audio CH1 input level.
8	LIGHT (right)	Indicator meter light. Lights when pushed.

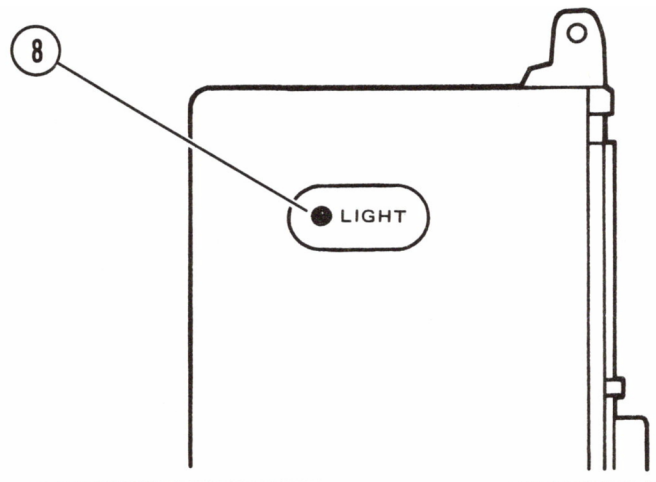
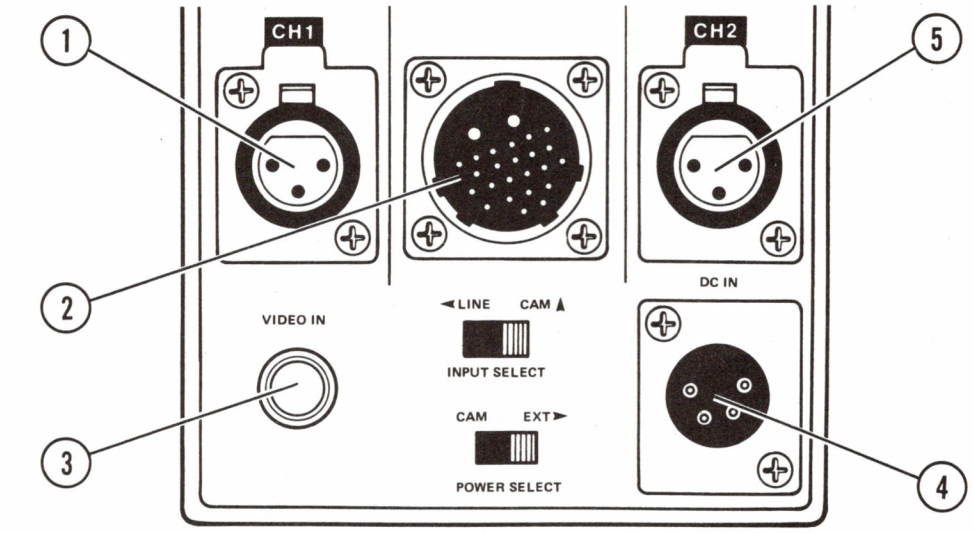


Table 3-7. Video Adapter Connectors



Index No.	Name	Function
1 and 5	AUDIO CH1/ AUDIO CH2	Audio signal input connectors (XLR type) 1. GND 2. HOT 3. COLD
2	CAMERA	Signal input connector (26-pin) from camera. A list of the pin signals is given below.

Pin	Assignment	Pin	Assignment
1	COMP VIDEO IN	14	VTR TAPE END
2	COMP VIDEO GND	15	VTR TALLY
3	Y VIDEO GND	16	
4	Y VIDEO IN	17	VTR GND
5	I VIDEO IN	18	CHROMA IN
6	I VIDEO GND	19	CHROMA GND
7	Q VIDEO IN	20	
8	Q VIDEO GND	21	DC +12V OUT (VTR--CAMERA)
9	MIC IN HOT	22	PLAY COMMAND
10	MIC IN COLD	23	RETURN VIDEO
11	MIC IN GND	24	RETURN VIDEO GND
12	VTR START/STOP	A	DC +12V IN (CAMERA--VTR)
13	VTR WARNING	B	POWER GND

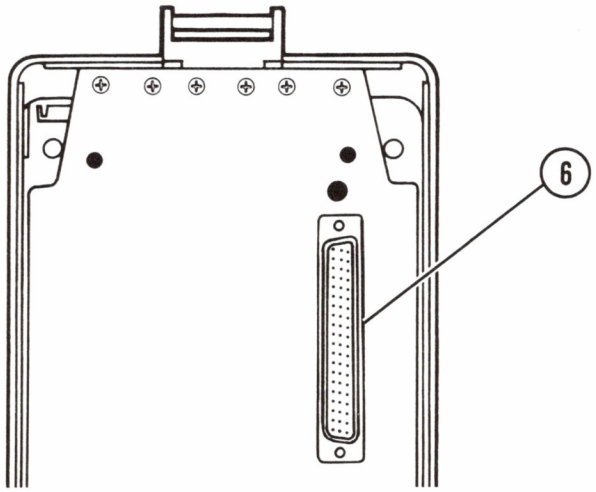
(Continued next page)

Table 3-7. Video Adapter Connectors (Continued)

Index No.	Name	Function
3	VIDEO IN	Input connector (BNC) for composite video signal.
4	DC IN	The ENG AC adapter (Ampex P/N1418572) is connected here when supplying power to the VTR from this or other source. In this case the POWER SELECT switch must be set to EXT position.
6	VTR mounting plate	This connector is used for connecting the electrical signals of the FPR-10 VTR to the FPR-S10 NTSC adapter. A list of the pin signals is given below.

Pin	Assignment	Pin	Assignment
2	VTR POWER +12V	28	"I" OUT
3	RETURN VIDEO GND	29	"I" GND
4	TC Generator POWER	30	AUDIO CH2 MONITOR
5	POWER GND	31	VTR POWER +12V
11	AUDIO CH2	51	AUDIO CH1
13	VTR START/STOP	54	AUDIO GND
17	AUDIO CH1 MONITOR	55	"Y" OUT
19	VTR GND	56	"Y" GND
25	RETURN VIDEO	60	VTR TALLY
26	"Q" OUT	61	VTR TAPE IND
27	"Q" GND	62	VTR WARNING

Note: Pins not listed cannot be used for NTSC adapter and VTR connections. They are provided for connection with other adapters and should not be used for any other purpose.



3-11 Notes on Operating the Lens

- Use the right hand to automatically zoom in or out and start the VTR.
- Use the left hand to manually adjust focus, iris, and zoom.
- Zoom operation may be manual or motorized depending on switch selection.
- Iris may be operated manually, automatically, or remotely depending on position of IRIS R/A/M selector switch. Remote operation is not possible when VTR is attached.
- Iris may be momentarily switched to the automatic mode (from manual position) by pressing the auto iris button.
- Video level may be affected by an amount equivalent to plus or minus 1 f/stop using the video level control.
- It is advisable to use the f/4 — f/11 range for best overall results. Refer to lens manual for detailed information.

3-12 Operational Checks

If no picture appears in the viewfinder, make the following checks:

- Make sure BATT/EXT switch is in correct position.
- Is camera in standby mode?
- Is the lens capped, or CC filter in "0" (closed position) or ND filter in "4" position? Is the lens iris in manual closed "C" position?
- Check brightness and contrast controls on the viewfinder.
- Is the ENCR/REGI switch in the ENGR position and both the G/OFF/-G and the R/OFF/B switches in the OFF position.

If color is incorrect on the color monitor check the following:

- Does the CC filter match the color temperature of the scene lighting?
- Was automatic black set when the lens was in the manual position? Automatic black should be set with lens in A (auto) position.

3-13 Automatic White and Automatic Black Balance Adjustment

The camera has a digital automatic white and automatic black balance circuit. The data is stored in a digital memory. When color temperature changes occur, set white and black balance as follows:

Note

Under conditions where there is not enough time to perform the white balancing procedure, set the W BAL AUTO/PRESET switch to PRESET. This corresponds to a lighting condition of 3200°K. If other lighting conditions prevail, adjust the CC filter as necessary.

STEP 1 Set W BAL AUTO/PRE SET switch (Index No. 13, Table 3-1) on camera to AUTO. Set IRIS R/A/M switch on lens (Index No. 3, Table 3-3) to A (auto) position.

STEP 2 Focus camera on a white chart.

STEP 3 Adjust camera position and lens zoom so that chart fills entire raster.

STEP 4 Set auto WHITE/BLACK switch on camera front panel (index no. 2, Table 3-1) to WHITE. Hold this switch in WHITE position until WARNING lamp in viewfinder lights indicating completion of automatic white balance process (takes about one second).

STEP 5 Set auto WHITE/BLACK switch on camera front panel (index no. 2, Table 3-1) to BLACK and confirm that the lens iris closes. Hold this switch in BLACK position until the WARNING lamp in viewfinder lights indicating completion of automatic BLACK balance process. The lens should reopen.

STEP 6 Repeat automatic white balance procedure of steps 2 through 5.

3-14 Video Recording on the VTR

The VTR record mode can be started and stopped using the VTR button provided on the right-hand side of the lens. When this button is pressed once, the VTR starts recording and the TALLY lamp in the viewfinder goes on. When pressed again, the VTR pauses and automatically backspaces (ABS) about 30 frames. To resume recording, press this button once again. The VTR starts pulling tape and will go into record mode about 27 frames from the backspace point. Maximum recording time is 20 minutes. There is an indicator in the viewfinder (three LEDs on the bottom) which indicates time remaining to the end of the tape (see Figure 3-1). When all three LEDs blink, the end of tape has been reached. The cassette can be ejected and another one inserted in its place.

3-15 Video Gain Selector Switch

The video gain selector switch has three positions, +9 dB, 0 dB, and +18 dB.The +9 dB position produces a higher video level that is equivalent to an increased lens opening of 1.5 f/stops. The +18 dB position increases the video level equivalent to opening the lens by 3 f/stops. Since the +18 dB position introduces more noise in the picture than the +9 dB position, use +9 dB setting if the video level is satisfactory.

3-16 Audio Recording on the VTR

The sound from the microphone mounted on the camera is recorded on audio CH1. Proceed as follows when recording any other sound source.

STEP 1 Connect the other audio source (such as another microphone) to the CH2 INPUT connector (XLR type) on the rear of the VTR.

STEP 2 Set the LINE/MIC switch to MIC when a microphone has been connected and to LINE when the line level source is used.

Note

Monitor the sound being recorded by connecting an earphone to the AUDIO MONITOR jack and setting the AUDIO MONITOR CH1/CH2 switch to CH2.

3-17 Sound Monitoring During Recording

To monitor the sound during recording, proceed as follows:

STEP 1 Connect an earphone to the AUDIO MONITOR jack.

STEP 2 Set the AUDIO MONITOR CH1/CH2 switch to the channel to be monitored.

STEP 3 Adjust the sound level using the AUDIO MONITOR LEVEL control. When rotated clockwise, the volume is increased; when rotated counterclockwise, it is reduced.

3-18 Audio Level Adjustment

The ARC-10 can record two channels of audio. CH 1 audio is introduced via the connector on the VTR mount base. (Normal level is -70 dB, microphone level.) CH 2 audio (normal level is -20 dB, line level) is introduced via the connector on the back of the VTR. The audio levels can be varied by the audio gain controls provided on the front left side of the camera. Audio levels are indicated within the viewfinder raster. See Figure 3-2.

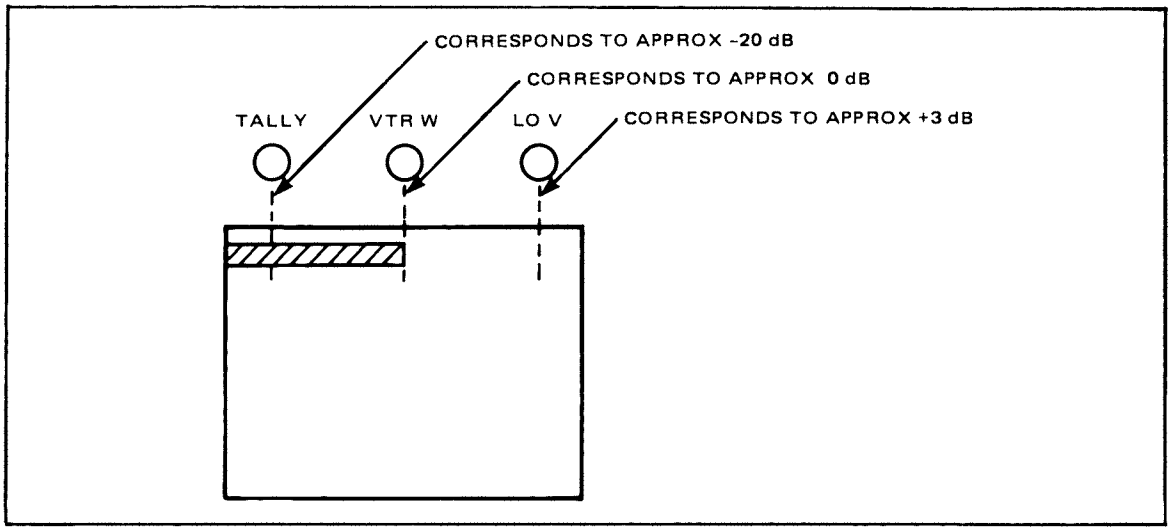


Figure 3-2. Viewfinder Indications of Audio Levels

3-19 VTR MODE CONTROL

Table 3-8 is a VTR mode-switching matrix. 0 indicates that the VTR is transferred to the desired mode on command. X indicates when a commanded mode will not occur.

Table 3-8. VTR Mode Switching Matrix

Current mode \ Desired mode	EJECT	REW	STOP	FF	REC OFF	REC ON	MANUAL EJECT
Cassette out		x	x	x	x	x	o
Tape rewind	x		o	o	o	x	o
STOP	o	o		o	o*	x	o
Tape fast forward	x	o	o		x	o	o
Recording	x	x	x	x		o	o
Auto back-space	x	x	x	x	o**	o	o
Standby	x	x	o	x	o		o
Tape loading	x	x	o	x	o		o
Tape unloading	x	x	x	x	o		o

* The VTR will not enter the record mode when the VTR start/stop switch is pushed if tape has stopped due to having detected end of tape, or if the mode was switched to rewind from tape end. After detecting end of tape, only rewind or eject modes can be entered.

** The record mode is established after the auto back-space operation.

3-20 VTR Warning LEDs and Mode Control

The VTR's warning LED displays, the indicated trouble, and the operation of the VTR when a warning is displayed are listed in Table 3-9.

Warning LEDs are:

- SLACK LED—Lights when tape slack occurs or when there is a problem with tape transport during recording. It also lights when the reel stops rotating for more than 0.5 seconds or when scanner motor is locked.

Table 3-9. Warning LED Displays vs VTR Operation

LED	Display	Trouble	VTR Operation
SLACK	Lights	1) Tape stops running in recording mode 2) Incorrect mode switching 3) Scanner and reel stop rotating	Unit is set to the STOP mode.
END	Blinks	Less than 1 min of tape remaining	Recording continues.
	Lights	Tape comes to end in recording or fast forward modes.	Unit is set to STOP mode.
SERVO	Lights	Irregular sync	Recording continues.
DEW	Lights	Dew formation	Recording disabled.

- END LED—Blinks when less than 1 min of tape remains for recording. The END LED lights when the tape-end is detected in the recording or fast forward mode and the VTR is set to the STOP mode.
- SERVO LED—Lights when the scanner servo or capstan servo is unlocked. If recording is continued in this state, the pictures will not be vertically locked.
- DEW LED—Lights when dew has formed inside the VTR.

3-21 VTR Mode Control Operation: Warning LEDs Lit

Table 3-10 is a mode control matrix that indicates what modes can be entered when the warning LEDs are lighted.

3-22 Video Adapter Preoperational Checkout

Check that tape is not running inside the VTR. If it is, stop tape movement using RECORD button on the video adapter or the start/stop switch on the camera.

Note

Since the FPR-10 VTR is a 0V trigger type, the camera's trigger polarity selector switch should be set to the " - " position.

Start the recording by pushing RECORD when the INPUT SELECT switch is set to line. If the same switch is set to CAM position, push camera's start/stop switch to start the recording. The RECORD LED lights when there is an input signal. It does not light when there is no input signal. Check the camera. To suspend the recording, press RECORD or start/stop switch again. The auto back-space mechanism is activated and the tape is rewound about 30 frames.

Table 3-10. Mode Control Matrix after Warning LED Is Lit

The VTR is set to the STOP mode when the SLACK LED lights during recording. When that happens, first press the camera's VTR start/stop switch and then set the VTR to the REC OFF mode. When the desired function button is pressed, the SLACK LED should go OFF and the unit set to the desired mode.

Function button / LED		EJECT	REW	STOP	FF	REC ON	REC OFF
Slack (lighted)		o Tape may become stuck	o Unit may not work or tape may be damaged	Auto stop	o Unit may not work or tape may be damaged	o See Note	o
END	Blinks	o	o	o	o	o	o
	Lit	o	o	Auto stop	x	x	o
SERVO (lit)		o o	o o	o o	o o	o Recording cannot be guaranteed	o o
DEW (lit)		o o	o Tape and heads may be damaged	o	o Tape and heads may be damaged.		

Mode control matrix after warning LED is lit.

o: When function button is pressed, the unit is set to the corresponding mode.

x: The unit cannot be set to the desired mode even when function button is pressed.

Note: Tape is loaded but unit is set to STOP mode when a malfunction persists.

3-23 NTSC Video Adapter Operation

- **Power Supply**—When power is supplied to the VTR from the video camera (this applies only to video camera with a 26-pin connector used for connection with the VTR), set POWER SELECT switch to CAM; when it is supplied from the DC IN connector, set switch to EXT. When connection is made with a camera using a 26-pin-to-26-pin conversion cable, power can be supplied to the VTR or camera by setting the POWER SELECT switch.
- **Power Turn-On**—When POWER switch is set to ON, power is supplied to the VTR. Set CH1/BATT/CH2 selector switch to BATT and check power capacity using the indicator. When connection is made with a camera using a 10-pin-to-26-pin conversion cable, power is supplied from the VTR to the camera. For power to be supplied from the camera, the camera must be modified.
- **Video Camera Adjustments**—Proceed to adjust the video camera. For details, refer to the instruction manual of the video camera being used.
- **Input Level Adjustment**—Depending on the channel to which the audio signals have been connected, set the CH1/BATT/CH2 selector switch to CH1 or CH2 and adjust the input level to near "0" using the CH1 or CH2 input level control.

3-24 SMPTE TIME CODE GENERATOR

The SMPTE time code generator is a generator which allows numbers from 000000 up to 235959 to be recorded on the tape indicating 23 hours, 59 minutes, and 59 seconds. The time display can be reset to 000000 at any time. During any mode other than record, the time code display may go through 000000 again. The actual time code generator advances the time code count up to 23 hours, 59 minutes, 59 seconds, and 29 frames. After this, time code is again 000000.

3-25 TIME CODE GENERATOR POWER SUPPLY

A dedicated nickel-cadmium battery powers the internal time code generator. When the VTR's power is cut off, power is automatically supplied to the generator from this battery. The battery is not coupled to the POWER switch. It is charged during the time when the ac adapter is attached and turned on. On a full charge the battery's backup function is operational for a maximum of four days.

3-26 Recording Time Code

The time code signal is recorded when the VTR is in the record mode. It is not recorded on the tape when the auto back space mechanism has been activated or when any mode other than record, such as rewind, fast forward, stop, and standby has been established. During auto back space operation, the time code generator is stopped in standby mode and is resumed three frames before interruption location. The time code recorded is thus discontinuous by three frames at the place where recording is interrupted. See Figure 3-3.

The time code generator display will be disabled for a maximum of about 10 minutes when the battery or ac adapter is re-attached after having been removed

for a long period of time. Irregular time code is recorded on the tape when the REW, FF or STOP function buttons are pressed but when the tape makes no contact with the video heads.

3-27 Setting the Time Code Time

Set the time code time as follows:

STEP 1 Press ADJ and SET simultaneously to reset display to "000000".

STEP 2 Press ADJ to make the counter "hour" display blink.

STEP 3 Press SET to set the hour. Hours can be set between 00 and 23.

STEP 4 To set minutes, press ADJ again to make the counter minute display blink.

STEP 5 Next, press SET to set minutes. Minutes can be set between 00 and 59.

Note

When SET is pressed and held down, the display is advanced rapidly. When ADJ button is pressed repeatedly, hours and minutes blink alternately.

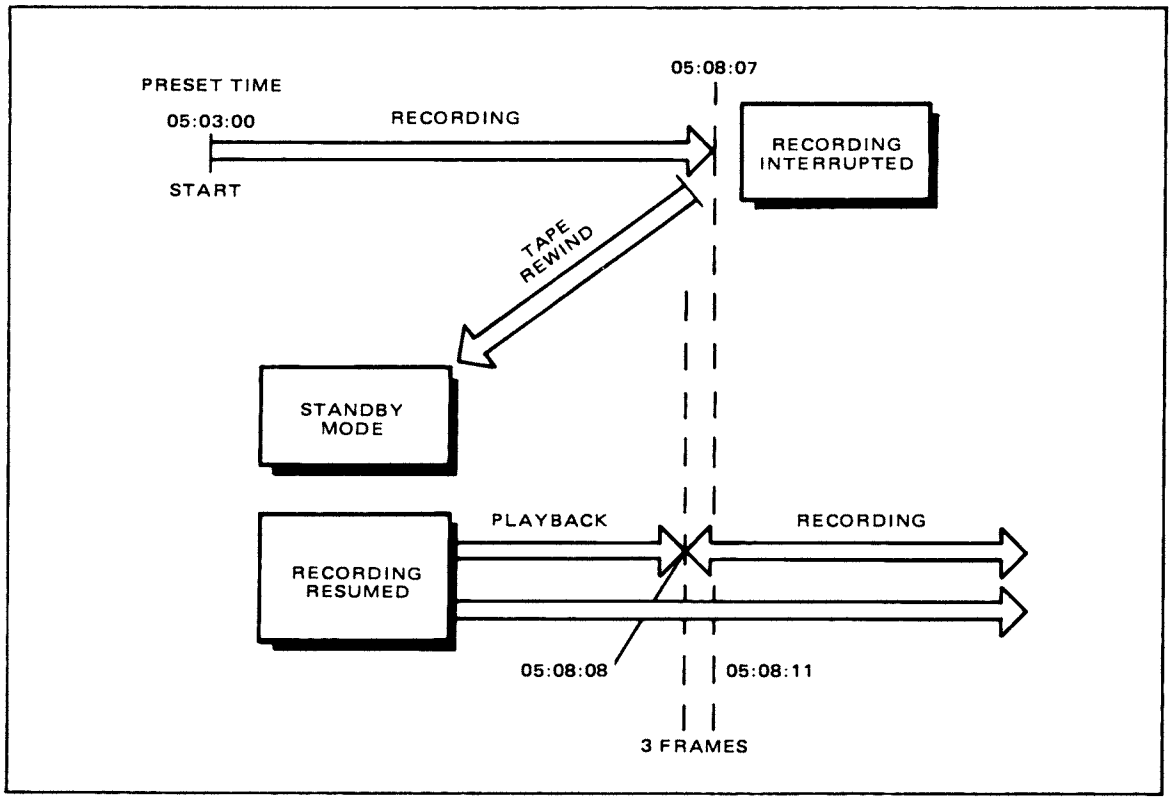


Figure 3-3. Recording Time Code

3-28 Time Code Start

After time code has been set, press START to start the time code generator. Note that the time code display is in hours, minutes, and seconds; actual time code recorded on tape includes frames up to 23 hours, 59 minutes, 59 seconds, and 29 frames.

3-29 CONNECTION TO EXTERNAL SMPTE TIME CODE GENERATOR

An external SMPTE time code generator can be used effectively when recording simultaneously with two or more ARC-10 camera VTRs. Connect generator to rear panel EXT TC INPUT terminal. See Figure 3-4. During post production editing, scenes that were recorded simultaneously on the VTRs can be identified to the frame because the recorded time codes were produced by the same time code source.

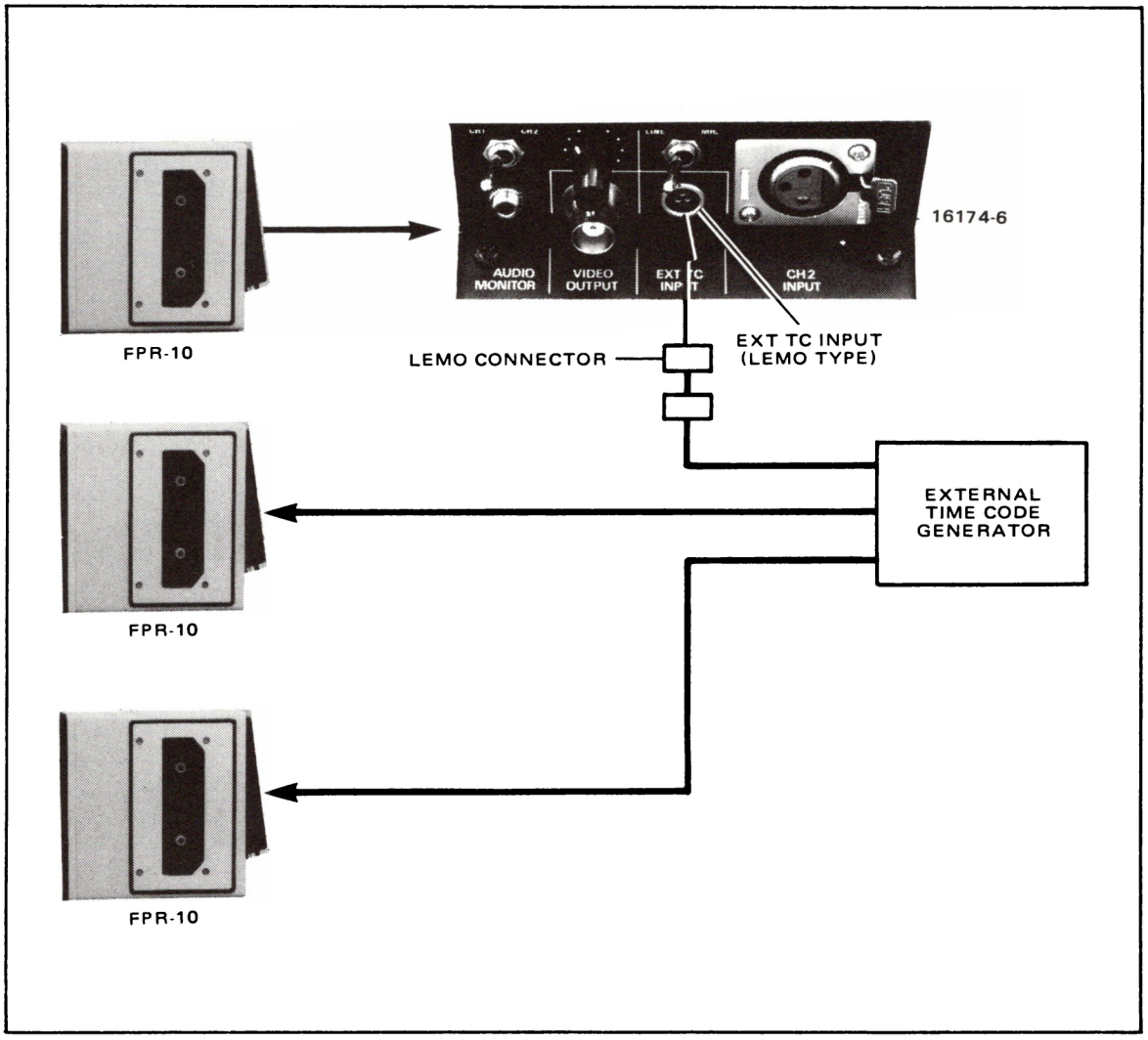


Figure 3-4. External SMPTE Time Code Generator Connection

The generator's time code circuit in the VTR switches automatically to the external generator signal. Use the optional accessory LEMO connector for time code generator input. Time code display on the VTR will continue to display internally generated time code and should be ignored. For details on time code adjustment, refer to the instruction manual accompanying the time code generator in use.

The circuit shown in Figure 3-5 is set up when the LEMO connector (optional accessory) is connected to the EXT TC INPUT connector.

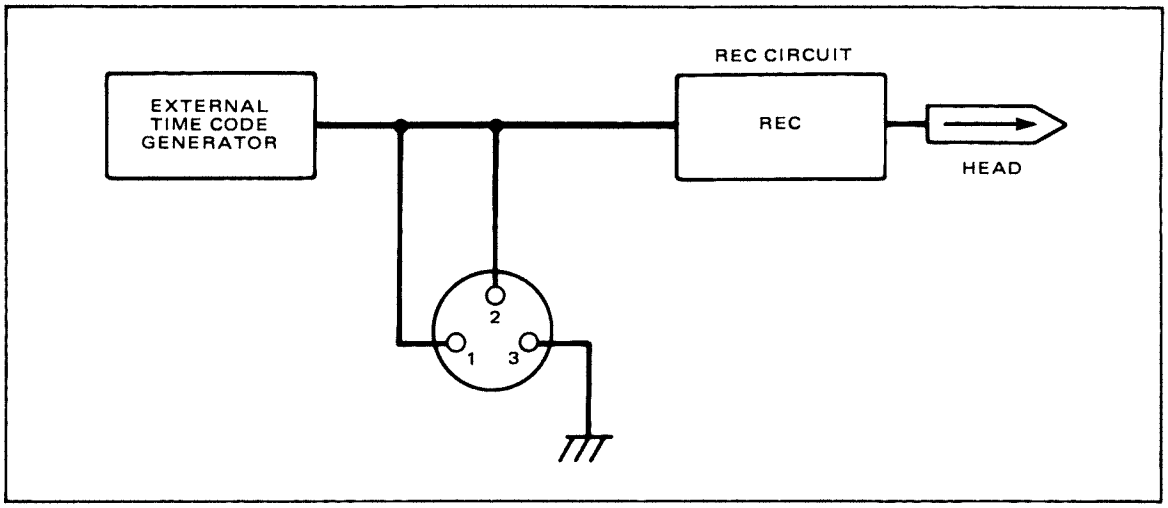


Figure 3-5. EXT TC Input Circuit

3-30 CAMERA SETUP ADJUSTMENTS

3-31 Centering Adjustment

After prolonged use, the centering adjustment may drift somewhat and must be readjusted according to the following procedure.

STEP 1 Connect a black and white monitor to MONI OUT connector (or use the viewfinder; set the viewfinder's PEAKING switch to OFF).

STEP 2 Focus on a registration chart that is fully framed in the raster.

STEP 3 Set the lens iris in the auto mode and note the f/stop on the lens ring.

STEP 4 Readjust lens iris from automatic to manual operation and reduce iris opening by 0.5 to 1 f/stop to obtain about 70 IEEE units.

STEP 5 Adjust lens focus.

STEP 6 Set registration controls as follows:
R/OFF/B switch to R
G/OFF/-G switch to -G
REGI/ENCR switch to REGI

STEP 7 Observe monitor (or viewfinder) and adjust CENT-RH and CENT-RV controls for line coincidence.

STEP 8 Set the R/OFF/B switch to B and adjust CENT-BH and CENT-BV controls for line coincidence.

3-32 Lens Setting (J13X9B IREII used as an example)

Back focus adjustment (focus tracking). This adjustment must be done when picture is out of focus at some point as the lens is zoomed over its entire range.

STEP 1 Set macro ring to the locked position (macro out).

STEP 2 Loosen the back focus lock screw.

STEP 3 Set IRIS R/A/M switch on lens to A for automatic operation and reduce illumination so that lens iris is fully opened.

STEP 4 Shoot an object about 10 meters away from camera.

STEP 5 Zoom in and focus the lens using focus ring.

STEP 6 Zoom out fully. Loosen back focus adjusting ring lockscrew and adjust back focus ring for best focus.

STEP 7 Repeat steps 5 and 6 several times until focus tracking is satisfactory.

STEP 8 Lock the back focus ring with lockscrew.

3-33 Lens Level and Response Setting

STEP 1 Shoot an EIA gray scale chart illuminated by 2150 lux (200 Fc).

STEP 2 Set IRIS R/A/M switch on lens to A for automatic lens operation.

STEP 3 Set the FINE video level control on the lens to the center detent position.

STEP 4 Connect a waveform monitor (or oscilloscope) terminated in 75Ω to MONItor output connector.

STEP 5 Switch the REGI/ENCR switch to the ENCR position.

STEP 6 Remove rubber dust cap from access hole for recessed auto iris video control adjustment screw; adjust control using a screwdriver. Set control for the 100 IEEE level. Cap access hole.

STEP 7 Remove rubber dust cap from the access hole for the recessed iris gain control; adjust control with a screwdriver. Set control for minimum hunting as the lens is closed by hand (or capped) and quickly opened.

3-34 PREFERENCE ADJUSTMENTS

3-35 Camera Identification System

In a multicamera system where several cameras must be matched, there is an identification black patch signal that can be added into the color bar signal. Up to 16 cameras (2^4) may be uniquely identified by the presence or absence of these patches in the Gr, Mg, Red, and Bl bars. These patches are selected by four switches on the Encoder 1 PWA. Two additional jumpers are provided for identification of up to 64 (2^6) cameras. This identification code is also useful for identifying which camera was used to make a tape recording if a short color bar segment is recorded at the beginning of the tape. Refer to paragraph 5-6 for the procedure for setting the ID patches. Figure 3-6 shows the location of the black ID patches in the Gr, Mg, Red and Bl bars of the color bar signal generated by the camera.

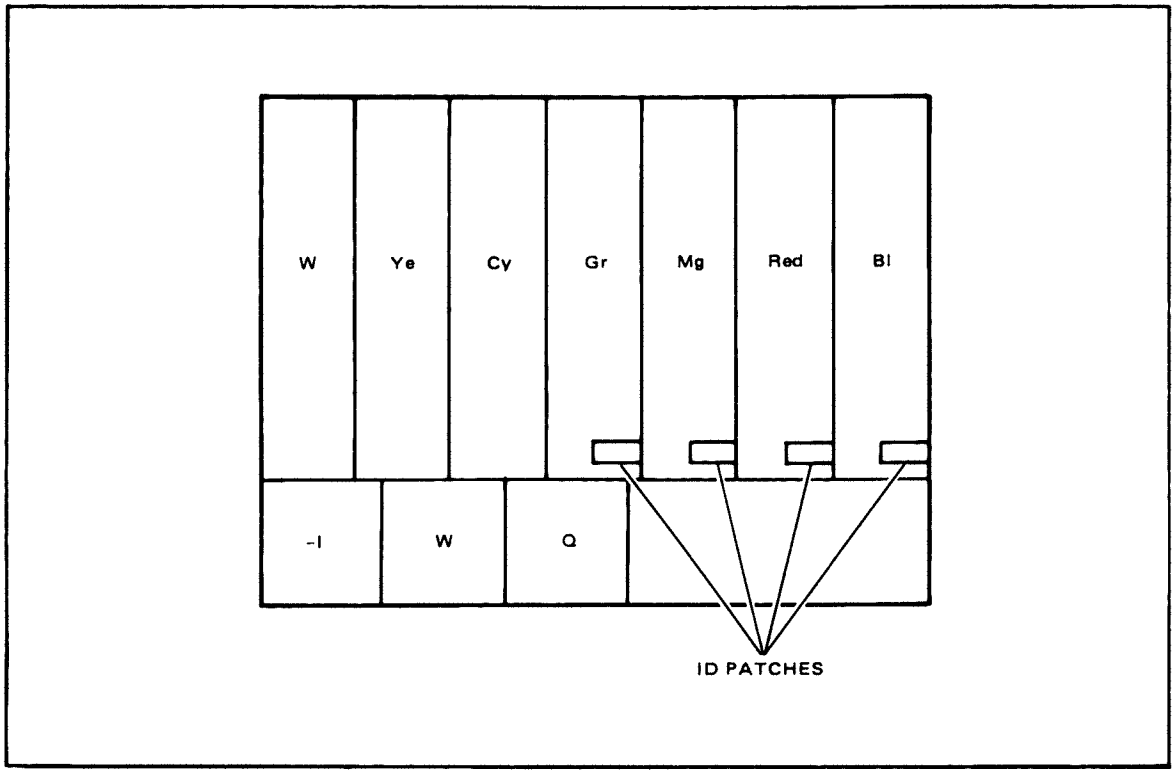


Figure 3-6. Location of ID Patches

3-36 Colorimetry Matrix Adjustment

If slightly different colorimetry is required or if cameras of different types must be matched, the R,G, B (and their complements Cy, Mg, Ye) vectors may be varied up to 10% from standard values using the colorimetry matrix circuit which may be turned on or off via a switch on the Encoder 1 PWA. Colorimetry adjustments should be done only by a qualified technician. Refer to paragraph 5-7 in the *Maintenance* section for colorimetry adjustment details.

3-37 Black Stretch Adjustment

Black stretch may be required in dark scenes having low contrast. When black stretch is turned on, the contrast at levels below 25 IRE is increased with some sacrifice in signal to noise. Refer to paragraph 5-8 in the *Maintenance* section for information on using the black stretch circuit.

3-38 Noise Slice (Coring), Detail Enhancement, and Level Dependent Detail Enhancement

Detail enhancement produces a crisper appearing picture. The amount of enhancement can be increased by the DTL control on the Encoder 1 PWA (see Figure 5-13). Increasing the enhancement level also increases the noise. Noise can be sliced off at the level set by the NOISE SLICE control which is normally set at the factory to remove 30% of the noise. Refer to paragraph 5-9.

SECTION 4
THEORY OF OPERATION

4-1 INTRODUCTION

This section provides theory of operation of the individual PWAs in the FPC-10 camera. Figure 4-1 is an overall simplified block diagram of the FPC-10 camera system.

4-2 POWER SUPPLY PWA

The Power Supply PWA generates a regulated +9V, regulated +6.3V, and a -3.5V supply. It has a low voltage sense and indicator circuit and a lens power supply. Figure 4-2 is a block diagram of the Power Supply PWA.

4-3 +9V Regulator

The +12 Vdc from an external battery enters at terminal 8. It is preregulated by U1 into +8V. Zener regulator D3 follows, keeping the reference voltage constant. The reference voltage is applied to differential amplifier U2 where it is compared to 9V which has been divided by R6/R7/R8. The resulting error drives transistor Q5, which in turn drives output transistor Q3, keeping +9V constant. Resistor R3 monitors output current and causes shutdown via current limiter Q4 when this current exceeds 2 amps.

4-4 +6.3V Regulator

Differential amplifier U2 and output transistors Q1/Q2 form a regulator that uses divided zener diode D3 voltage as a reference on pin 3 of differential amplifier U2. This is compared to output +6.3V which has been divided by R11/R12. The error at pin 1 of U2 drives complementary pair Q1/Q2, whose emitters provide a stable +6.3V used to supply power to the three tube heater elements and form a return path for the bias light power which is driven between +9V and +6.3V.

4-5 -3.5V Supply

Current amplifier Q7/Q8 is driven by WIDE HD pulses generated by the Sync Generator PWA. Capacitors C9, C10 and diodes D6 and D9 form a clamp and rectifier circuit followed by 3.9V zener diode D10 for regulation.

4-6 Standby Mode

During the standby mode a low appears at terminal 12 causing +9V to shut down by turning off transistors Q3 and Q5 via diode D4. Diode D7, circuit U2, etc., cause +6.3V to drop to +3V during standby. This keeps the tube heater elements warm for instant startup when shooting is resumed.

4-7 Low Voltage Warning

When the input dc falls to about +11V, U5 pin 1 goes high, shutting off diode D8. This causes the other op-amp section of U5 to start oscillating and produce a 1-Hz signal at pin 13. This signal is passed to U5 pin 2 which flashes the low voltage warning LED inside the viewfinder.

During automatic white/black balance operation a low appears on pin 6. This generates a high at pin 2 of U5 turning the warning LED off. When the operation is completed the LED turns on.

4-8 Lens Power

The lens power is supplied by transistor Q6 which is normally turned on by a low from comparator U5 pin 14. When the camera is turned off, pin 14 goes high in a few seconds. The lens closes automatically when the IRIS AUTO/MANU/REMO switch on the lens is set to AUTO.

4-9 SYNC GENERATOR PWA

Sync generator U1 produces all necessary timing pulses used in the camera. Figure 4-3 is a block diagram of Sync Generator PWA. This PWA divides the 14.3-MHz signal provided by VXCO and assures that the 3.58-MHz subcarrier at pins 26 and 27 is stable to within ±10 Hz over the specified temperature range. The 3.58-MHz signal, derived internally by a 1/4 countdown of the 14.3-MHz signal, after being counted down by another factor of 1/161 is phase-compared with VCO signal 4.090908 MHz appearing at pin 3 or 4 divided by a factor of 1/184. The resulting dc error is filtered by an RC network between pins 5 and 6 and fed to variable capacitance diode D01, which keeps 4.090908 MHz on track. All pulses except 3.58 MHz are derived from a 4.09-MHz internal clock. This includes SYNC, BL, HD, VD, BFP, DLVD, DL, HD, WIDE HD and CP (and LINE SW pulse, a pulse which appears every other horizontal line).

Process blanking (PRO BL) is derived from VD and WIDE HD pulses in IC5 pin 10. Encoder blanking (E BL) is derived from VD and HD. Two gate monostables, using C12/R01 and C13/R02, adjust V BL width and H BL width respectively.

Jumper J2 permits using BL as it comes from the IC (in this case H BL is 11.25 µs and V BL is 20H lines long). WIDE HD and CP (clamp pulse) are buffered by analog switches U04. The two subcarrier signals (90° and 180° phase) are available directly from this IC, reducing the amount of phase shift required during I/Q encoding. Capacitors C16/C17 are used to shape output pulses to more closely resemble the required sine waves.

4-10 Genlock

When a genlock adaptor is used, the 3.58-MHz subcarrier which is internally generated by U1 sync IC, is compared to the burst signal from the incoming genlock signal with the dc error introduced to terminal 12 on this PWA. The 4 Vdc varies the VXCO-generated 14.3 MHz in the direction that makes both 3.58-MHz signals of same frequency and phase.

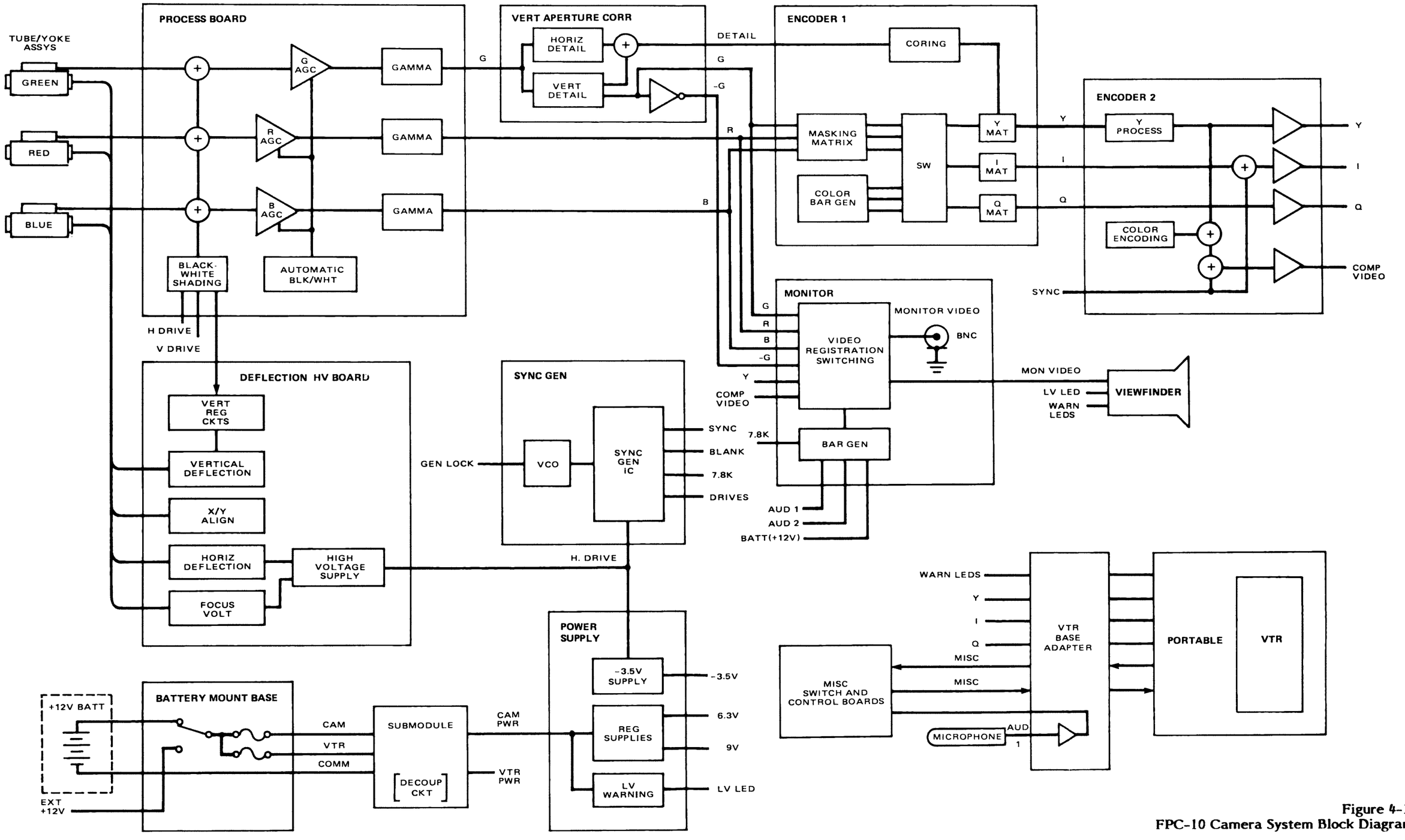


Figure 4-1.
FPC-10 Camera System Block Diagram

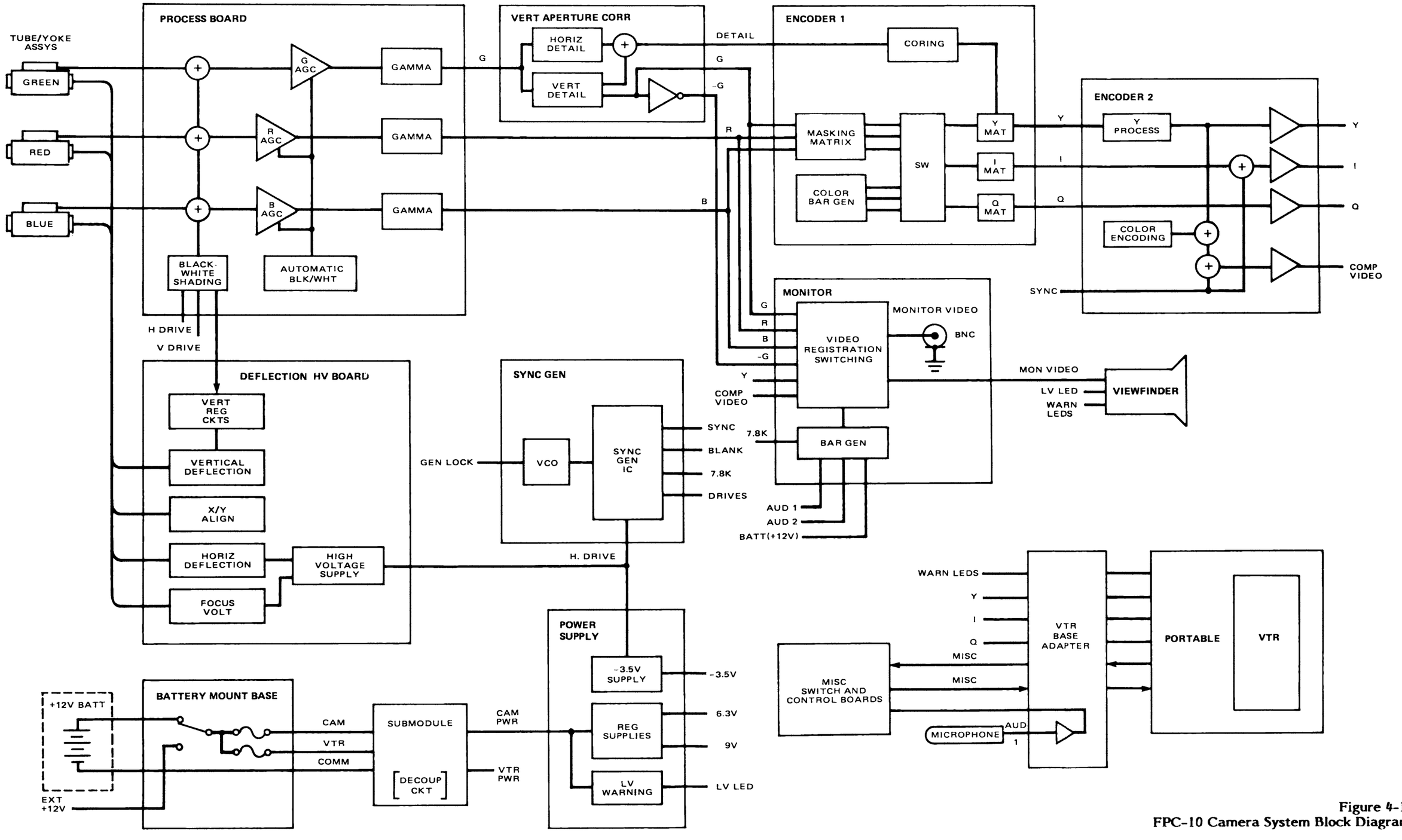


Figure 4-1.
FPC-10 Camera System Block Diagram

In the genlock mode the INT/EXT control signal at PWA pin 5 switches off the signal path between the RC low-pass filter between pins 5 and 6 of U01. Instead the sync-lock dc error voltage from the genlock adapter is permitted to vary the D01 varicap capacitance in the direction which keeps internal and external H timing the same.

V-lock is achieved when the V-lock pulse on PWA pin 11, coming from the genlock adapter, is in phase with the DL VD signal generated internally. Internal to the U1 IC at pin 19 is a threshold circuit which is able to sense when internal DL VD is on, but not coincident with D01 turn-on caused by external V-LOCK. In this case the threshold circuit causes an internal V-RESET to 1/525 internal counter. Note: diode D2 is a triple silicon diode that drops 2.0V.

4-11 PREAMPLIFIER PWA

Each of the three preamplifiers consists of two parts: a preamplifier using a low-noise FET transistor and another section providing gain stages. Dc feedback via R18 (and C4/C5) is also included for stabilization and frequency-response adjustment (C5 and C6).

4-12 ENCODER 1 PWA

The main function of the Encoder 1 PWA is to add incoming R, G, and B signals in normal 0.3R + 0.59G + 0.11B proportion to make up the Y-luminance signal. However, this proportion can be varied in order to obtain different colorimetry. See Figure 4-4 for a block diagram of the Encoder 1 PWA.

The Encoder 1 PWA also processes R, G, and B signals to make up a narrow-band 0.5-MHz Q signal (carrying purple-green color information) and a wide-band 1.5-MHz I signal (carrying orange-cyan color information).

EIA split-field I/Q color bar signal is also generated on this PWA. This signal contains both the 77-IRE white signal in the normal bar segment, and 100-IRE white signal in the I/Q segment.

The edge signal carrying video detail information is added into the Y signal to enhance visible resolution.

A unique camera identification code is generated here and superimposed over the color-bar signal.

4-13 Matrix Circuit

The R, G, and B signals appearing at Encoder 1 PWA pins 17, 15, and 16 are combined in the emitter of Q5 (R26, R27, R28, R29, R30, etc.) to make up the Y signal, normally 0.3R + 0.59G + 0.11B. This is the standard NTSC luminance signal which is amplified by Q5 and is then delayed by 0.48 µs and buffered by Q7/Q8. It leaves the PWA at a 1.5-Vp-p level.

Differential amplifier U1, together with G divider R5/R6/R7, produces the k1 (G-R) + G signal at U4 pin 3, a CMOS analog switch which routes the signal through Q11 buffer to a fixed resistive matrix in the emitter of Q5 as mentioned above.

Similarly, pin 11 of U1 produces the R-G signal which is combined with the R signal at R10. The resultant k2 (R-G) + R signal is passed through pin 13 of analog switch U4 and buffer Q9, and reaches the film resistor matrix at R29/R30. Analog switch U4 pin 1 receives the k3 (B-G) + B signal derived by differential amplifier U2 pin 11 and R14. This signal is sent to R26/R27 via buffer Q10.

R7, R10, and R15 are used to change the normal 0.3R + 0.59G + 0.11B proportion of R, G, and B signal components which make up the Y-luminance signal without affecting the white balance.

Matrix on/off switch S1, if grounded, disables the above action and in this case the luminance Y becomes normal 0.3R + 0.59G + 0.11B.

4-14 Edge Mix

Analog switch U4 passes the camera signals at pins 13, 1, and 3 to outputs at pins 14, 15, and 4 when a control signal at pins 11, 10, and 9 is high. When this signal is low R, G, and B pulses corresponding to color bar signals emanating from U3 pass through the analog switch instead.

The DTL signal at PWA pin 11 carries edge detail information. It is derived from the green channel processed on the Two-Line Vac PWA. The edge-detail signal is passed by buffers Q2, Q3 and added to the luminance signal at the base of buffer Q4.

Because human vision is such that we perceive noise more easily in the dark areas of a picture and less easily in the bright areas, more edge detail consisting largely of high-frequency components, including video noise, is added in the bright areas of the picture; less is added to the dark areas.

This selective addition of edge detail into luminance is controlled by FET Q1 which, together with resistors R88/R18/R19, acts as a voltage-dependent attenuator. The signal that drives the gate of FET Q1 (from the Two-Line Vac PWA) makes sure that more edge-detail signal is passed during high video levels (bright picture).

The addition of edge detail may be inhibited by the DTL ON/OFF signal line at Encoder 1 PWA pin 18. Detail enhancement will be off when PWA pin 18 is grounded, and on if pin 18 is open-circuited. Diode D6 disables edge detail when color bars are turned on by a low signal at PWA pin 8.

Diodes D3/D4 and bypass capacitor C8 comprise a noise-suppression circuit. R23 varies the diode threshold voltage from nominal 0.6V and thus selectively blocks noise signals which appear in the edge detail signal component (normally at a higher amplitude level, thus passing through this diode obstacle). R25 adjusts the amount of detail enhancement to be mixed into the luminance Y signal.

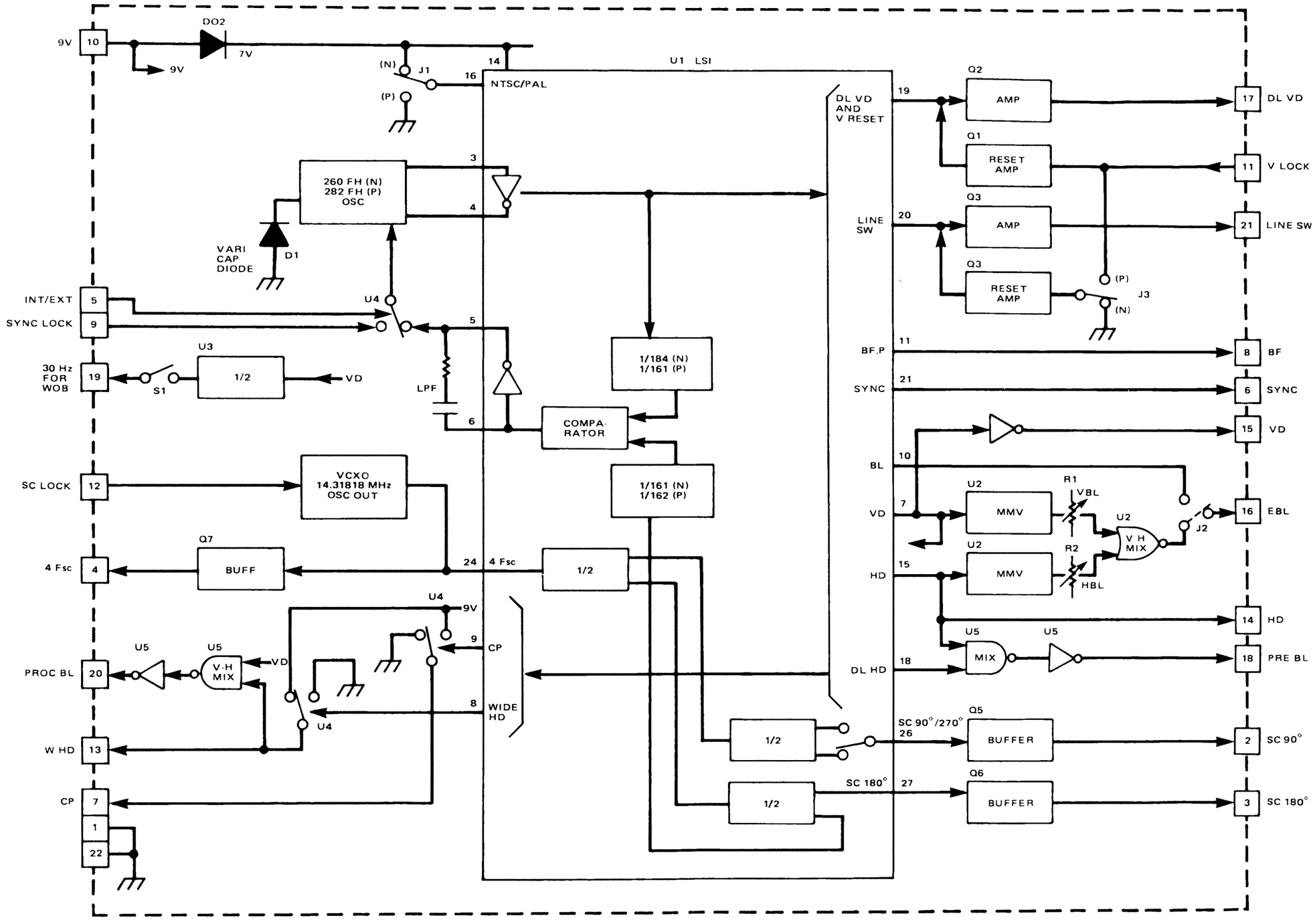


Figure 4-3.
Sync Generator PWA Block Diagram

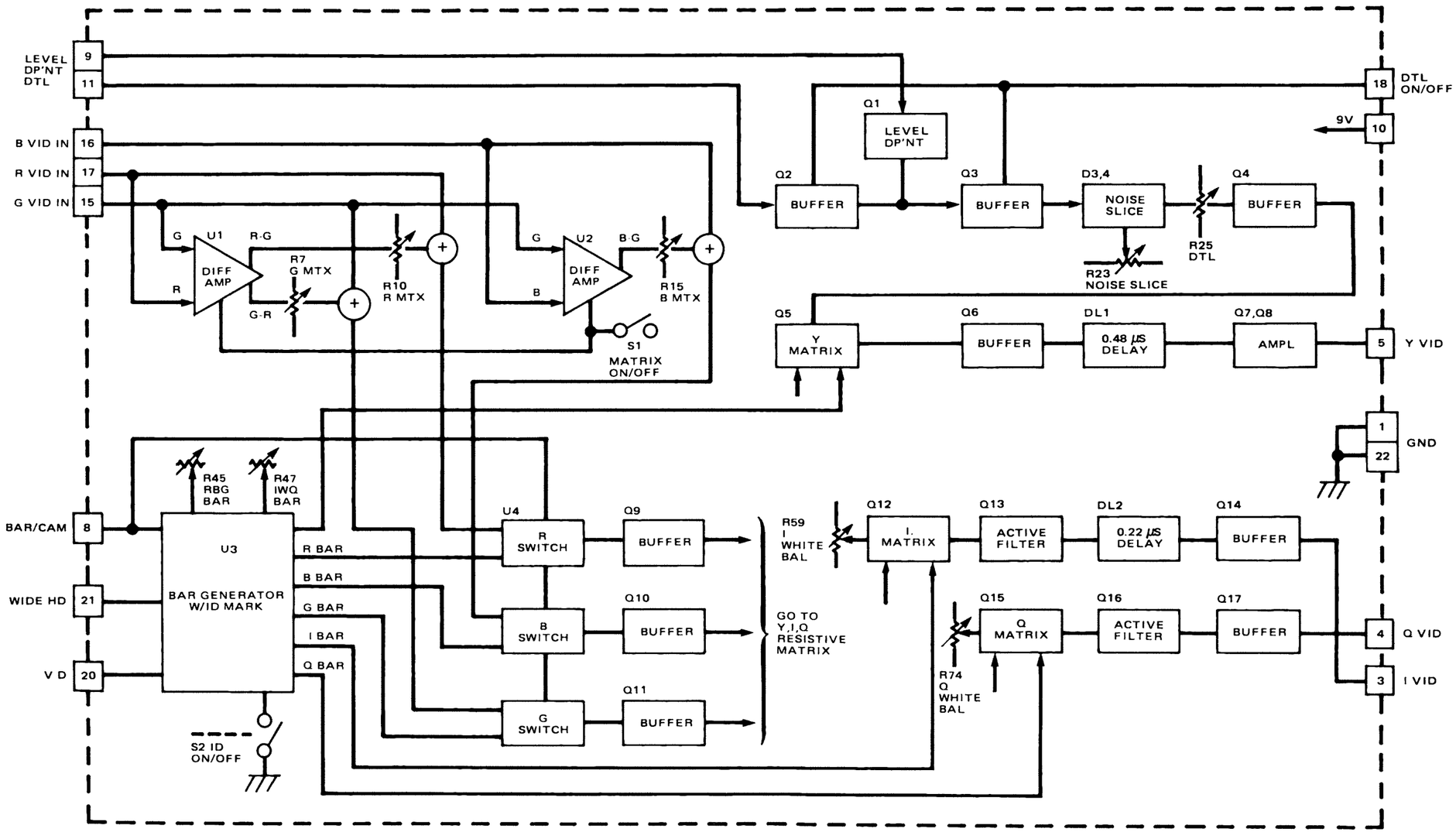


Figure 4-4.
Encoder 1 PWA Block Diagram

A resistor matrix in the emitter of transmitter Q12 adds R, G, and B signals to form the I signal. The capacitor/resistor network in the base circuits of Q12 and Q13 form an active low pass filter with cutoff at approximately 1.5 MHz. The 0.22-µs delay line DL2 slows down this wide-band (wider than Q) signal so that Y, I, and Q signals become coincident in time. Encoder 1 PWA pin 3 outputs the I signal to Encoder 2 PWA. Similarly, the resistive matrix in the emitter of transistor Q15 forms the Q signal which is band-limited to 0.5 MHz by an active low pass filter before being buffered by transistor Q17.

4-15 Color Bar Generator

EIA split-field color bar signal generation is done by U3. It receives HD pulses that are used to trigger the horizontal bar timing generator. Normal color bar width is adjusted using R45. VD pulse is used to split the raster into normal color bar section and I/Q section. Resistor R47 adjusts the horizontal width of I, Q, and 100 IRE white bars.

Pins 13 and 15 on U3 are routed to I and Q resistive matrix in Q12/Q15 emitters. This camera produces, in addition to EIA color bar signal, a camera identification code. This is a small black patch superimposed over the color bars. If the color bar signal is coming from camera no. 3, the patch is over the magenta bar. If the patch were over the blue bar, it would identify camera no. 1. Up to six cameras can be so identified, normally via S2 switch and two jumpers located on the Encoder 1 PWA.

The camera operator or studio engineer must identify the cameras by either a single patch, in which case six cameras may be identified, or by a binary code, whereby sixteen cameras may be identified using S2 switch, excluding the jumper wires.

All switch contacts and jumpers are normally open (no code is generated). When closed, a black patch should appear over the corresponding color bar.

4-16 ENCODER 2 PWA

See Figure 4-5 for a block diagram of the Encoder 2 PWA. The main function of the Encoder 2 PWA is generation of a composite NTSC video from the Y, I, Q signals provided by the Encoder 1 PWA. This involves generating a 7.5-IRE setup level, clipping a residual signal resulting from two-line Vac processing, inserting sync, and burst components, and quadrature modulating the I and Q signals on the 3.58-MHz subcarrier. In addition to the composite NTSC signal, I and Q signals (unmodulated) are produced here for use by the FPR-10 portable VTR which records Y signal with one video head and the I and Q signals with another video head.

The Y-signal enters at pin 5 and is clamped to a dc level determined by resistive divider R3/R4/R5/R6. Transistors Q2/Q3 and resistor R11 which sets up the conduction level of transistor Q3, comprise a white clip circuit. Transistors Q4/Q5/Q6 pass the signal but clip components below blanking (a residual signal from the Two-Line Vac PWA). The black clip level is determined by setting R8.

The signal is then routed through analog switch U1, from pin 2 to pin 15, unaffected, or through pin 1 to pin 15, where the dark signal components (between 7.5 and 20 IRE) are black-stretched by transistors Q8, Q9, i.e., the gray values become more distinguishable.

The 7.5-IRE setup is introduced by transistors Q10 and analog switch U1, pins 12 and 14 only during blanking time (control signal on pin 11 of U1). The rest of the time the Y signal is routed between pins 13 and 14 and it is mixed with sync supplied through R40. The output drive provided by transistors Q13/Q14 is adjustable via R36.

The output at pin 13 is applied to a monitor select circuit where the signal is routed to PIX OUTPUT and VF video. Pin 12 provides VTR luminance/sync for recording on the VTR.

The clamp pulse, determined by U3 pin 9, 10 pulse and R44/R45 potentiometer, is added to the I and Q signal, before being introduced into pins 4 and 6 of U4—a dual double-balanced modulator. The clamp pulse is actually introduced into pin 9 of U4. Burst signal is also generated here by introducing the burst flag pulse into I and Q modulators. This is done by R50 and R52.

The 3.58-MHz subcarrier is introduced into the U4 modulators via pin 2, Q23 and Q24. Resistors R90/R91 and capacitor C49 comprise a 90° phase shift network that introduces the sub-carriers into the modulator in quadrature.

I/Q switch working with conjunction with C18 is used for setup only, i.e., when only I or only Q signals are needed such as when adjusting quadrature phase (VR90 for example).

The combined modulated I and Q signals appear at pin 1 of U4 and are passed through U1 (pin 5 to 4) analog switch. The signal is cleared up during blanking time (excluding burst time) via control signal at U1 pin 9 when U1 pin 3 and 4 are connected electronically.

A 3.58-MHz bandpass filter consisting of C29/30/31//32 and L2/3 remove unwanted harmonics.

The chrominance signal is combined with luminance and sync in Q22 and is routed to NTSC output on the back of the camera via terminal 15. PWA pin 14 routes the same signal to MONI out and VF.

I and Q signals enter the PWA at pins 3 and 4, are routed to output amplifiers Q25/Q26 and Q27/Q28 (with adjustable gains R98 and R104 respectively) and then output via pins 9 and 11. Note that processed sync, a pulse signal, is inserted into the I signal. Pulse delay is adjustable via R86 and its amplitude is controlled via R95. These I and Q signals are not modulated and are base-band signals. Further processing takes place inside the FPR-10 VTR prior to recording.

4-17 DEFLECTION HV PWA

This PWA has a horizontal deflection circuit with side correction for the R and B channels, three vertical deflection amplifiers with top/bottom geometry correction, a dc-dc converter which provides all high voltages required by the pickup tubes, a set of beam alignment current sources, a focus regulator (for the Plumbicon camera version only), a skew correction circuit, and a focus rock circuit for proper beam alignment. Figure 4-6 is a block diagram of the Deflection HV PWA.

HD pulse, introduced at pin 14 is divided by R114/R112 and applied to switching comparator U9 pin 2. Pin 3 is normally held low by a forward-biased diode D11 which is turned off when the sweep is turned off to protect the pickup tubes. Comparator U9 pin 2 output is limited by diodes D13/D14 and drives transistors Q4/Q5 which are connected in parallel.

When transistors Q4/Q5 are switched off, transformer T1 resonates with capacitors C59/C60. Diode D15 is turned on during the first half of each active line (damper diode action) and transistors Q4/Q5 during the next half. A horizontal deflection sawtooth is supplied at terminal B (or terminal C during overscan condition) to the three deflection yokes via inductors L4/L5/L6. The yokes are wired to pins 2 and 3 of P36/P37/P38 connectors—dc currents are returned to +6.3V via L7 and ac currents are returned to ground via C48.

C48 linearity correction is done by the H SAW signal applied via pin 8 to R115 and U10 op-amp whose output is dc level-shifted by D12 and V_{BE} of Q3. Since this sawtooth is integrated by the coils, the correction is parabolic, i.e., a linearity correction.

Horizontal centering adjustment is possible by selecting dc levels via R50/R51/R52 which divides the potential difference between +9V and U10 pin 7 voltage follower. These levels are routed by U5/U6 op-amps to feed the respective yokes through L1/C2, L2/C22, and L3/C25 horizontal deflection waveform decoupling circuits.

The other two signals which are injected through U5/U6 are external horizontal centering dc levels by R42/R38 and skew waveforms (vertical sawtooths via R36/R40/R54) which correct trapezoidal distortion in the mix/vertical position.

Highest voltage appears at pin F of T1. It is multiplied/rectified by D20 to D24 voltage tripler supplying B+ to G6 (Saticon) or G4 (Plumbicon) at P36/P37/P38 pin 6. Divided voltage from C70 goes to G5 electrode while G2 is supplied with still lower voltage from C71. Electrical focus voltage is also derived from the divided tripler and supplied to G3 focus electrodes. The two terminals of P33/P34/P35 receive +6.3 heater voltage.

Transformer T1 terminal is a source of -100V (Saticon G1 supply only) via C33/C36, D4/D5 rectified. A similar rectifier shown below -100V supply gives origin to -50V cathode supply. The shunt regulator transistor Q2 and R77 regulates not only -50V, but all high voltages since it affects the pulse peak amplitude across C60 which is normally about 80V.

For alignment purposes, an overscan switch SW1 is provided to pick off the higher waveform at T1 transformer C point instead of the normal B point. This action increases horizontal deflection alone. Vertical deflection size increase is described below.

All three vertical amplifiers work in a similar fashion and therefore only blue is fully described. The difference is in the G channel which has no vertical remote centering control facility nor top/bottom second-order deflection correction. The output of U7 pin 7 op-amp drives the vertical B deflection coil connected between terminals 4 and 5 of P35 through R90 (22Ω) resistor. The return current flow is through R87 to +6.3V line.

The required vertical sawtooths are generated outside of this module and come in at terminals 10 and 11. Potentiometer R165 picks off the misbalanced sawtooth buffered by Q7 and added to another vertical sawtooth (height correction component picked off by R158) and vertical parabola (linearity correction component picked off by R150). All these are routed via C39 to U7 pin 6. Pin 5 of the same IC receives a vertical centering dc component from R99 (internal adjustment and a second order correction) from IC U16 pin 4.

Note that when SW1 overscan switch is in OVERSCAN position, Q6 FET is turned on (C73 is a pickup prevention capacitor) which increases the sawtooth level at Q7 base and therefore increases vertical scan.

When vertical deflection is normal, diodes D8/D9/D10 are turned off; pin 7 of U9 IC is high and output pin 8 is low (about 1V appears at U9 pin 3). HD pulse is divided from normal 7V to about 2 Vp-p by R114/R112 and U9 switches on/off to generate all high voltages. When diodes D8, D9, or D10 turn on by a fault condition, pin 8 of U9 goes low turning V MOSFETS off; high voltages disappear and the tubes are protected. Disappearance of HD will cause a similar protection sequence to take place. Standby does the same through ON diode D16.

Beam alignment coils (X and Y for each tube) need appropriate amounts of current to properly position the beam in the center of the tube gun structure so that the landing on the target is almost perpendicular over the entire raster. These are provided by U1/U3/U4 op-amp current sources. Resistor R3 adjusts current direction and amount going through B-X beam-alignment coil. C6 acts as an integrator and keeps the current from fluctuating.

Beam alignment is normally set using a registration or Ball chart, and injecting a 30-Hz waveform into G3 (focus electrode) for Saticon tubes. IC U8 pin 6 receives 30-Hz pulses from the Sync Generator PWA when the S01 (WOB) switch on the Sync PWA is activated. Diodes D17/D18 limit the signal from 0—12 volts. Capacitor C62 injects horizontal and vertical parabolas and horizontal sawtooth into G3 to act as dynamic focus in order to have even focus throughout the raster area.

In the case of the Plumbicon tube, which has magnetic deflection and magnetic focus, U6/Q1 focus current regulator is included on the PWA. Focus current emanates from Q1 collector and is routed through the three coils wired between terminals 10 and 11 on P36/P37/P38 connectors and is returned to R73/R74/R75.

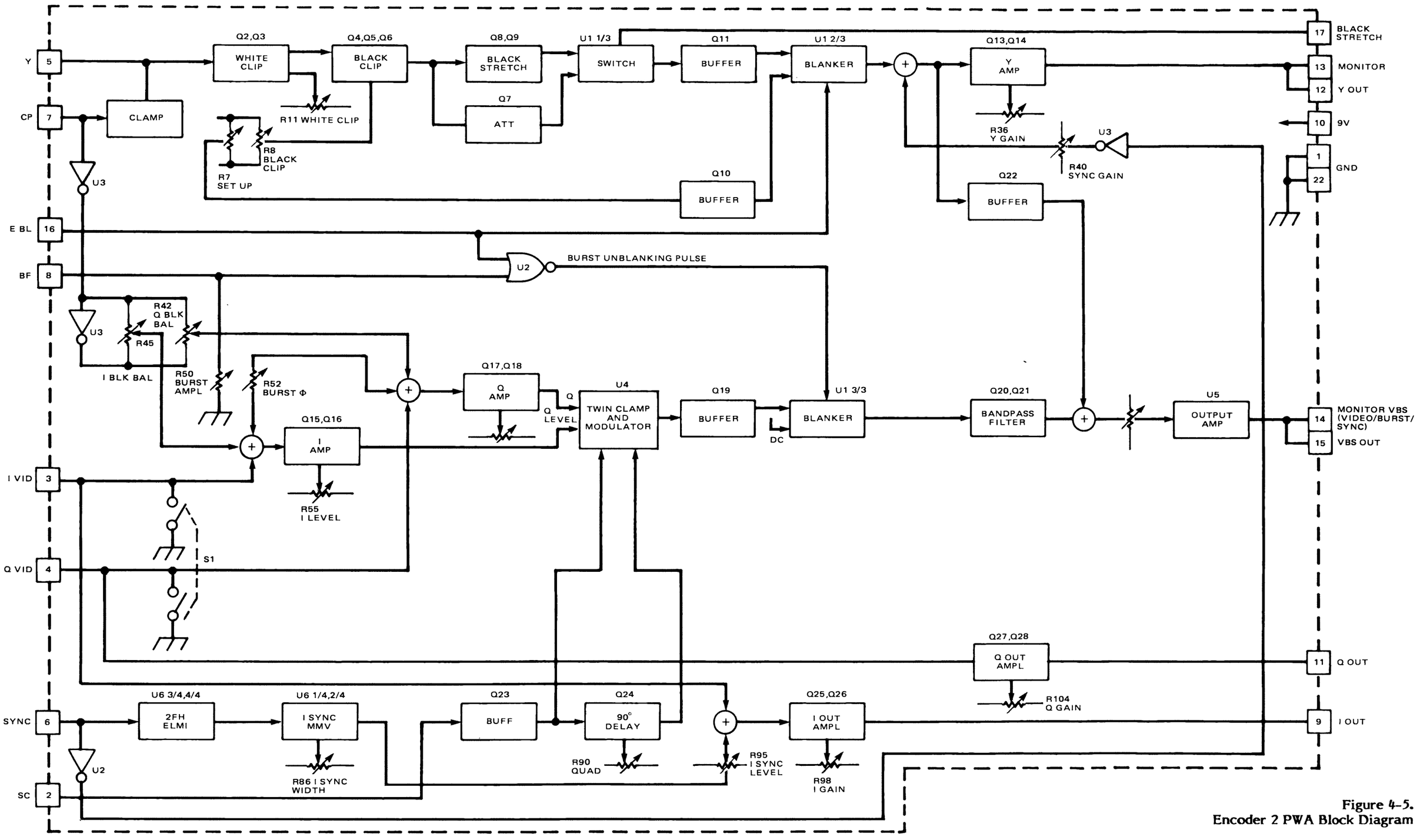


Figure 4-5.
Encoder 2 PWA Block Diagram

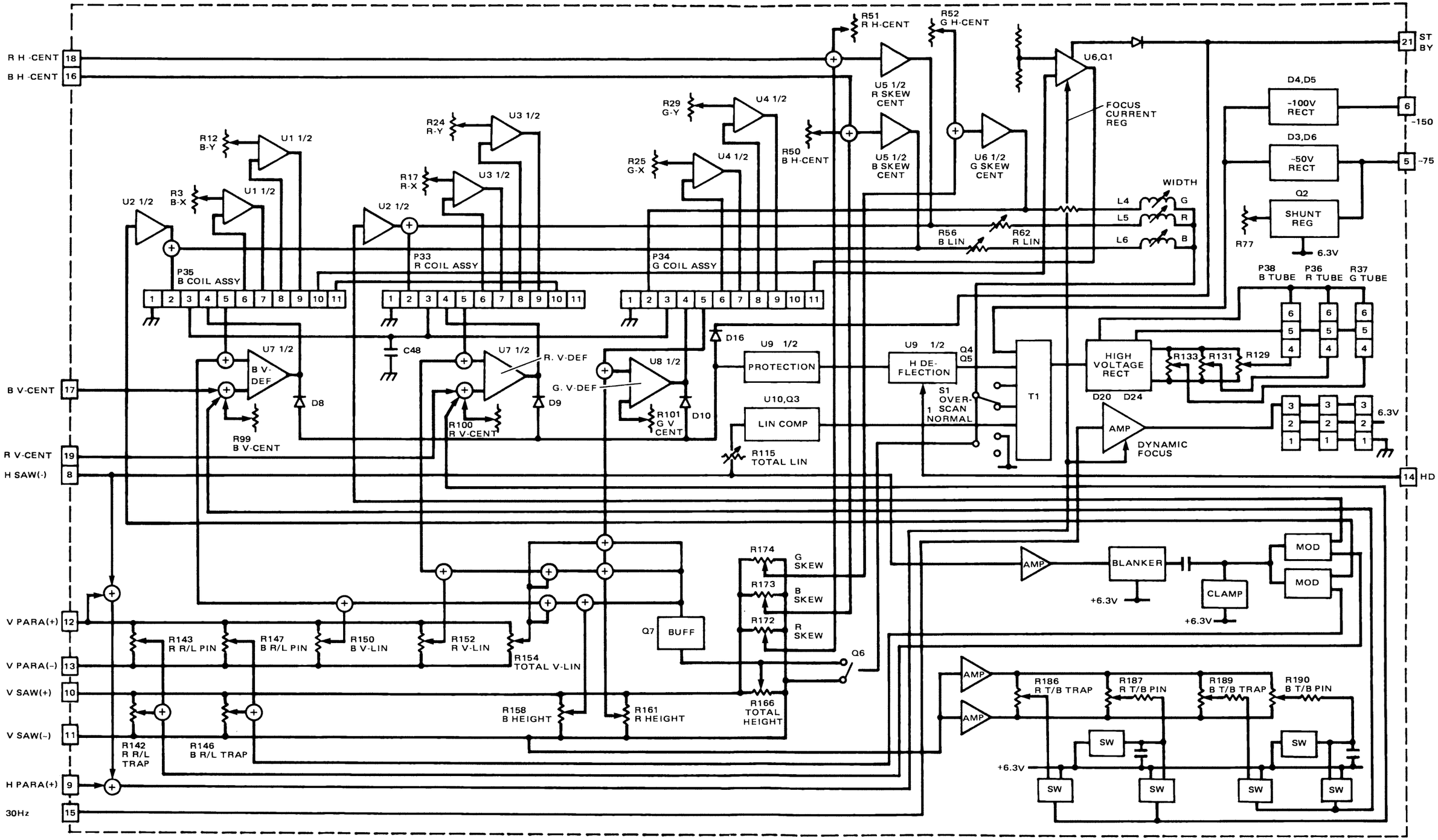


Figure 4-6.
Deflection HV PWA Block Diagram

This current is wobbled by the 30-Hz signal injected through C26 during beam alignment. In standby condition focus current is turned off for power preservation.

To summarize, in Plumbicon-tube cameras, U6/Q1 circuit is included but R125 is excluded. In Saticon-tube cameras, R125 is included but U6/Q1 circuit is excluded. Transformer T1 is also different for different camera versions.

Circuits are provided to compensate for misregistration errors due to pincushion and trapezoidal distortions.

A horizontal sawtooth supplied through C78 and U11 buffer is made to modulate vertical saw (via R149) and vertical parabola (via R148) inside U13/U14 modulator ICS. U12 pin 14 CMOS analog switch eliminates sawtooth decay during blanking and U12 pin 15 is made to clamp the sawtooth at R178/R177 divided +9V voltage.

The red U13 pin 7 second-order correction waveform is routed to U2 pin 3 while blue U14 pin 7 is injected into U2 pin 5.

Top/bottom registration errors are similarly treated without the use of modulators via U15/U16/U17 ICS.

The vertical sawtooth introduced via C83 is buffered by U15 pin 1 and inverted by U15 pin 7 so that R186/R189 and R187/R190 are able to balance them out (for no correction) or unbalance them in a particular direction according to amount of correction needed. C85 and C87 integrate the sawtooth and produce parabolas. CMOS analog switches U16/U17 serrate (chop) the waveform at HD rate.

4-18 PROCESS PWA

Figure 4-7 is a block diagram of the Process PWA.

R, G, and B are three identical signal channels which process the preamplified signals (0.26 Vp-p at normal illumination level) and deliver gamma-corrected 0.5-Vp-p signals at the output that will be NTSC encoded. Besides normal amplification and frequency response setting, this process involves removing residual noise during the blanking interval and FBC action to resolve extreme highlights by selective boost of beam reserve when needed.

In addition to WHT CLIP setting, the process on this PWA provides NAM (non-additive mixed) video, similar video for automatic lens control, and automatic setting of black and white balance; gamma correction is also included. Since the three processing circuits are similar, only the red (R) channel will be described.

4-19 Pulse Cancel and Shading Corrections

The R preamplified signal appearing at TP201 is mixed with PRE-BLANKING pulse during the inactive time period, and with the horizontal and vertical parabolas and sawtooths as well as corner-correction signals, during the active line period. The corrections are made for two reasons:

- Dark shading—the target structures of pickup tubes are not uniform due to manufacturing tolerances so that the light-to-electrical signal response is not necessarily the same at the center of the tube as it may be in the corner.
- Mod shading—the action of the beam-splitting prism is not ideal due to the difference in the vertical angle of light incidence along the surface of the prism. This results in vertical shading, i.e., the top of the picture may be a slightly different color from the bottom.

In order to compensate for target deficiencies, a small amount of correcting waveform is added via R203 (in the case of the R signal). This amount is set by a series of potentiometers on the Process Sub PWA. Mod shading vertical sawtooth is introduced by R96 which goes to pin 12 via R261 of U203 to affect R channel gain at bottom and top of the picture.

Automatic gain control of this stage is accomplished by a fixed dc level emanating from U08 pin 32. This is a peak level control and sets up white balance. It is actually achieved by matching peak R and B signals to peak G signal (G signal gain is not adjusted by automatic circuits).

During automatic black balance setting, IC U08 gives out another dc signal on pin 29. This level is introduced via R252 and U202/U215 into the emitter of transistor Q210 in the R channel. A similar level from pin 28 of U08 controls black balance in the B channel. There is no such auto signal in the G channel and black balance is achieved by matching R/B levels against the G level set only by M-PED on the setup panel. Switchers S202/S302/S402 are normally set in CAM position which is indicated on the circuit. They are set in the test position when a test sawtooth signal is to be introduced into the individual channel.

Transistor Q210 and Q211 are an amplifier whose gain may be increased by +9 dB or +18 dB when Q208 or Q209 are turned on by a signal from the 0/+9/+18-dB gain switch accessible to the operator of the camera.

The preblanking pulse introduced at terminal 9 turns on transistor Q201, a dual-gate FET. During this time a dc level set by R65 is introduced into the signal path by R203. Similar levels are introduced into the other two channels.

When the lens is closed the NTSC output is determined by residual noise and these three levels. Should there by any misbalance in these, especially when the 0/+9/+18-dB gain switch is activated, the output will have a particular color shift. Check to be sure that no such color shift exists at 0/+9/+18-dB gain positions when adjusting PULSE CANCEL potentiometers R65/R67/R69.

The R signal is buffered by transistor Q202 and forwarded to gain-controlled amplifier Q204-Q207. Switch S201 located on the Process PWA is used for shutting off the FBC action in the R signal during alignment of the camera. Resistor R211 and trimmer capacitor C207 are used for setting gain and frequency response of the R channel.

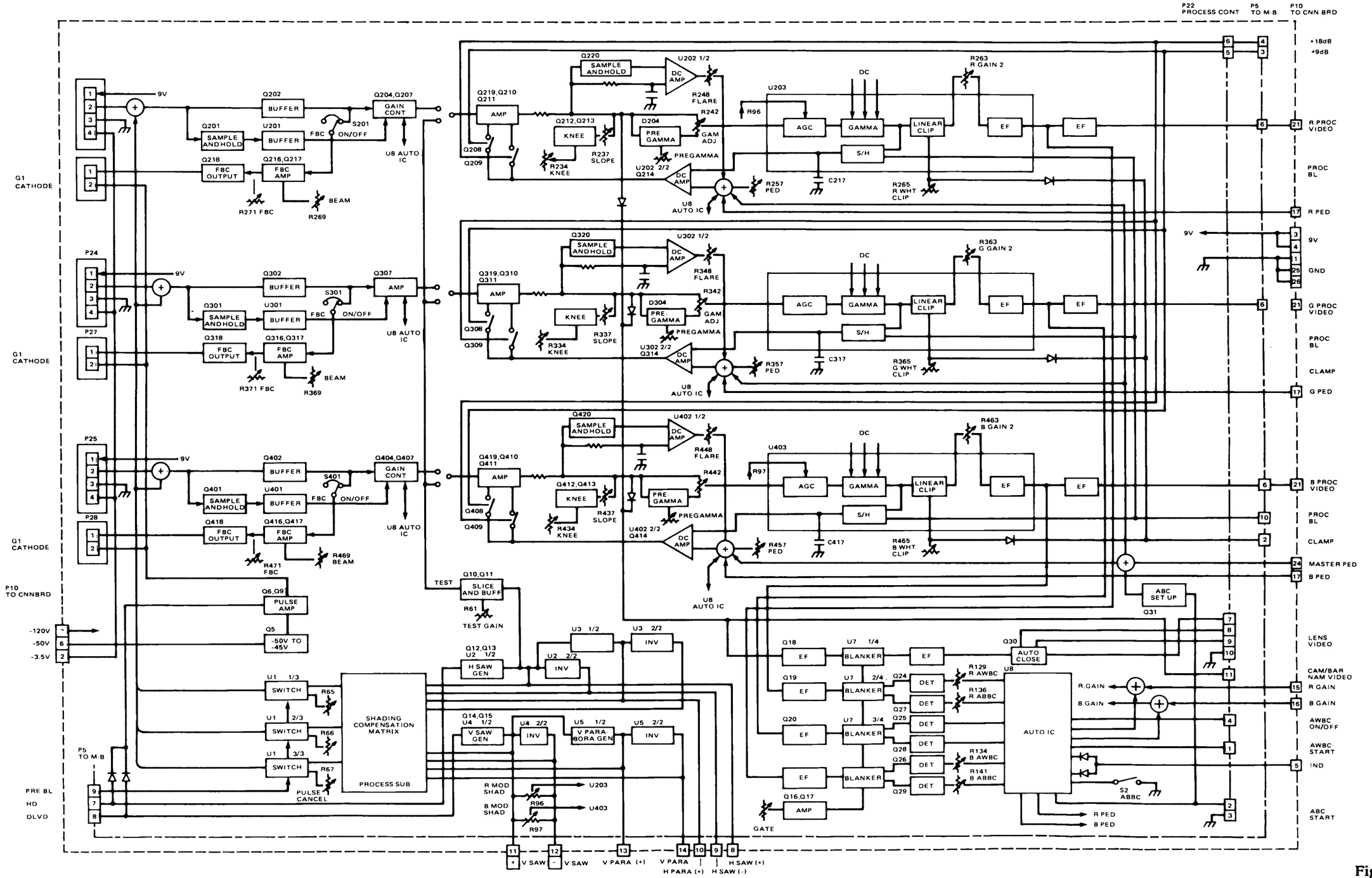


Figure 4-7.
Process PWA Block Diagram

4-20 Automatic White/Black Balance

Diodes D205/D305/D405 form a nonadditive mixer circuit, i.e., whichever of R, G, or B signals is the highest level is out-boarded on terminal 11 as NAM video.

The same signal from the emitter of Q18 is passed through a CMOS analog switch and Q22 emitter/follower to terminal 9 in order to automatically control the lens opening so that the output signal always remains at 100 IRE. The signal which is used to control the lens is sampled in the entire raster.

This circular sampling of video also takes place between Q19/Q20/Q21, Q24/Q25/Q26, and Q27/Q28/Q29, rectifying the signal and smoothing it into dc levels by C23/C24/C255 and C27/C28/C29). Note that the G level is fixed by resistive divider ratio while that of R and B are adjustable by R129, R134 and R136, R141. All of these levels enter U08 IC which is an 8-bit dual (white and black balance) IC. While it is powered by the camera's 9V at pin 1, it is also able to maintain its internal memory state for a long period of time, even when the camera power is shut off. This is assured by a small battery (B-1 BATT) located on the Process PWA. It supplies power to pin 19 when +9 Vdc is off for any reason.

The control signal applied to pin 31 of IC U08 comes from the operator's AUTO/PRE SET switch. In the PRE SET position automatic white balance cannot be achieved so that both R and B process amplifiers go to their normal state, i.e. their gains are those which are preset at the factory. When the switch is in the AUTO position, auto white balance can be set; auto black balance can be set to the same position depending on the position of the WHITE/BLACK switch also accessible to the operator, which introduces levels to pins 25 and 23 of U08.

Note that there is a signal path between ABBC (terminal 2 on the Process PWA) and automatic lens shutdown circuit Q30. This closes the lens when auto black balance is being set.

A small switch attached to pin 30 of U08 IC disables ABBC commands, which is necessary in order to set up the black balance using R and B PED (R257/R355/-R457).

IC U08 has two internal digital clocks whose frequency is set by C32 and C31. The two diodes connected to pins 35 and 20 route a signal to the viewfinder that tells the operator that either automatic white balance or automatic black balance is in progress.

4-21 Gamma and Gain

The collector of Q207 (in the R channel) is dc-coupled through Q210/Q211 and all the way to the output terminal 21. Zener diode D203 is used for dc level shifting and C209 to attenuate noise from diode avalanche action.

This point is coupled to pin 7 of U203 IC which performs gamma correction. Prior to that, the signal undergoes pregamma correction; at low light levels the gamma curve is used to stretch blacks more than the normal gamma correction. This correction is accomplished by R242, which sets the pregamma slope when switch S203 is ON. Pregamma correction may be switched OFF if not desired.

Transistors Q212/Q213 and R234 (knee point) and R237 (knee slope) control the video levels between 105 and 120 IRE. It is a form of white suppression. The knee point is adjusted for suppression to begin at 105 IRE; the slope controls the amount.

This feature is very useful when the camera subject (a face, for example) is backlit. With gradual suppression, the face is seen better than with no suppression. Suppression can be turned off for the RCU only by a control signal which appears at terminal 20 on the Process PWA.

The white clip action is set by R265 which is normally adjusted for 115 IRE. Main gamma correction is accomplished inside U203 via dc control levels which appear on pins 13, 14, 15. These levels are set by voltage division between R111--R114, which are stable metal film resistors tied to pin 1 of IC U06. Switch S01 is used to turn gamma correction off. Signal gain is set by R263 prior to NTSC encoding. R and B gain is also controllable from RCU side via dc levels at terminals 15 and 16.

4-22 Pedestals and Flare Correction

IC 202 pin 7, together with transistor Q214, affects the lowest levels of video signal. Resistive junction point at IC 202 pin 6 receives dc signals from five sources:

- Master PED from terminal 24 affects all three channels simultaneously.
- R PED from terminal 17 which is a manual R pedestal control.
- Auto black balance signal which comes from U08 pin 29.
- R257 divided B-level which is an internal R pedestal adjustment.
- U202 pin 1 op-amp with adjustable gain R248 which lowers R pedestal level during conditions which give rise to flare.

Flare arises due to internal reflections inside the lens and in between target layer elements. Flare usually appears when most of the picture is white with some small dark area. The white portion is unaffected by flare but the dark portion appears either reddish or greenish as though these pedestals were raised. Automatic flare correction lowers these in order to keep black balance. Although all three channels have a flare correction circuit, very little correction is needed in the B channel and most is needed in the R channel, since flare is wave-length dependent. U402 in the B channel is included to keep level and impedance balance. R448 in the B channel should not need adjustment.

4-23 Feedback Beam Control (FBC)

The target voltage in this camera is held at approximately 0V irrespective of the type of tube being used. The cathode drive, consisting of Q06, Q09 and receiving HD and DL VD pulses for tube beam blanking, is powered by -50V supply for Saticon tubes, and -45V for Plumbicon tubes. This is decided by a jumper on the board Q05 voltage divider transistor. The grid (G_1) is driven from either a -100V and -50V supply in case of normal gun, or a -50V and 0V supply in case of diode gun. The voltage on G_1 sets up the beam which is used to resolve the positive image-related charge built up on the target during the interval between two successive scans.

In the case of the R channel, the normal beam current is adjusted by R269 to discharge the highlights at a particular illumination condition, a logarithmic gray-scale chart, and a particular f/stop on the lens.

During normal shooting, when a highlight is encountered which exceeds the beam reserve normally set up by R269, the FBC circuit comes into play and its function is to increase the beam only during these times to discharge the excessive highlight charge.

Transistor Q203 and one-step gamma correction performed by a resistive divider and diode D201 drives Q217, whose base is tied to a fixed blanking sampled dc level. When a signal highlight is encountered above the beam capacity of normal beam setting, G_1 driver Q218 responds by providing more beam in order to discharge these highlights. Potentiometer R271 (FBC gain) is used to adjust the upper level at which target discharge can be accomplished (three or four f/stops above f/4 for Saticon and Plumbicon respectively).

FBC circuit assures sufficient beam at extreme highlights only during highlight condition. It prevents fast tube aging and distorted corner registration/geometry which would result if the beam level above was raised above normal. The same circuit is included in all three channels.

4-24 Test Signal

An H-rate sawtooth is generated by Q12, Q13 and U2. It is buffered by Q10 where its level is set by R61. It is then introduced to test switches S202/S302/S402 via buffer Q11. This waveform is used only during process circuit adjustments.

4-25 MONITOR PWA

Figure 4-8 is a block diagram of the Monitor PWA. This PWA forms the R-G/B-G signals for monitoring registration adjustments which can be done by watching the viewfinder or another monitor connected to MONI out connector. The individual R, G, B, and -G can also be monitored, as can the luminance signal.

In addition to the picture display, the operator is able to observe audio CH 1 level and either audio CH 2 level or battery condition. This is done by injecting a white pedestal (well above 100 IRE) into the viewfinder luminance signal in two spaces 4H wide. The audio level and/or battery condition is indicated by a change in the length of these white bars.

Along with this function, but independent of it, is an indication of when the video signal exceeds 100-IRE level. Picture areas where video is excessive are indicated by blanking every other line only in the areas where video is too high. This is done by using the PAL pulse from the sync chip which is designed both for NTSC and PAL systems. The PAL pulse occurs every other horizontal line.

Divided +9V is picked off by M (master) PED, R/B H center, and R/B V center potentiometers and sent to the deflection circuits for control of registration, and to the Process PWA for control of all three pedestals.

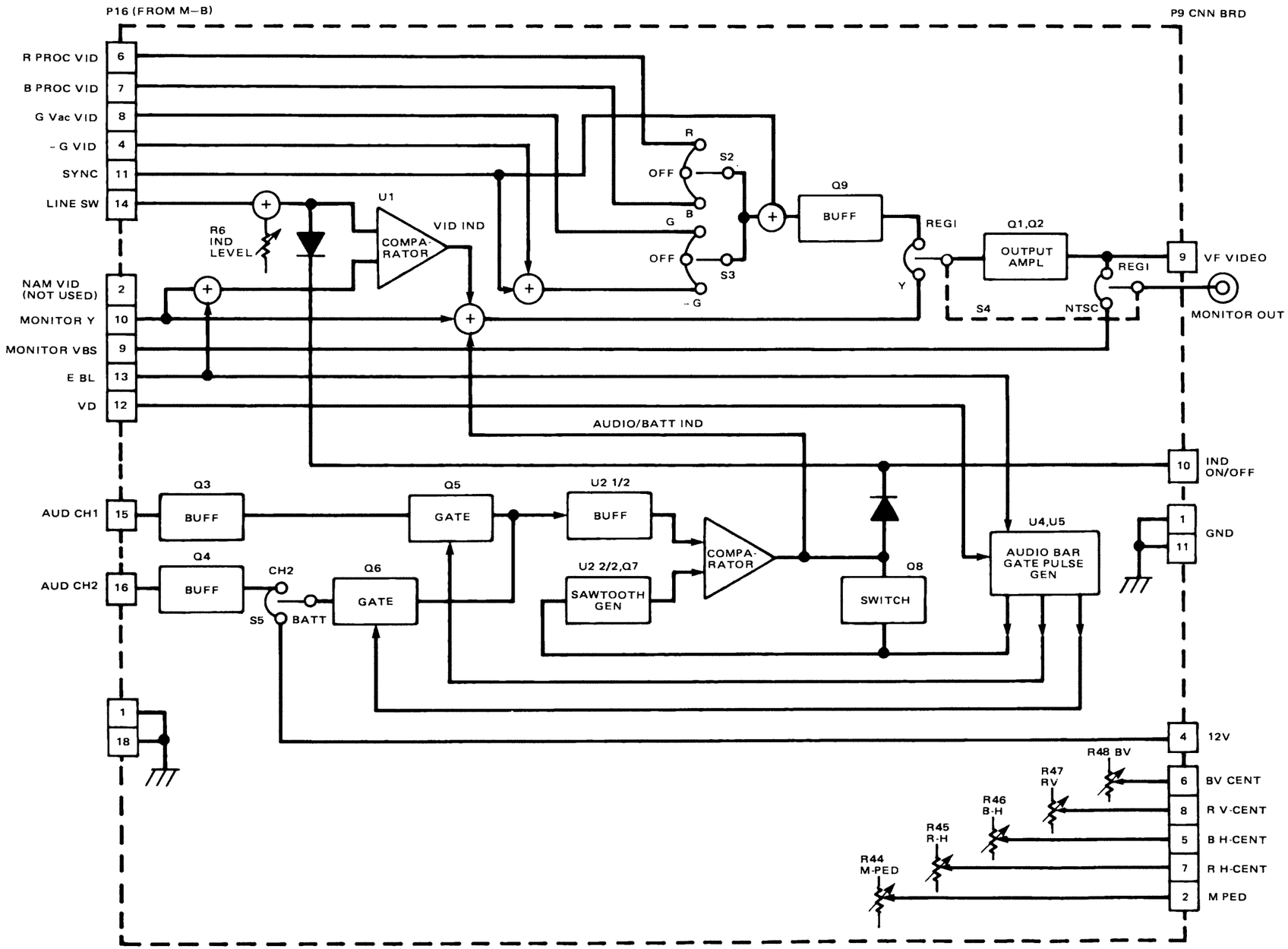


Figure 4-8.
Monitor PWA Block Diagram

4-26 VF and MONI Signals

Transistors Q1 and Q2 distribute the SW 4 selected signals to viewfinder and MONI output. Switches SW2/ SW3/SW4 are able to select R, G, B, -G, R-G, B-G, as well as the luminance signal for display. Sync is added in all cases via R16. When video exceeds the dc threshold defined by VR6, video appears on pin 3 of U1, but at the same time serrated by black PAL pulses added at pin 2 of U1. This function only works when Y signal is selected for viewing.

4-27 Audio/Battery Monitoring

Audio signals or divided +9V are permitted to pass through turned-on transistors Q5/Q6 one at a time. These signals are buffered by U2 pin 7 and routed to pin 2 of comparator U3 which injects the waveform indicator into the luminance signal. Capacitor C7 in the feedback loop of U2 (pin 2 and 1) is discharged during blanking by turned on FET Q7 only during level display time. During active H time U2 pin 1 generates a sawtooth which is compared to a level at U3 pin 2. When this audio or battery level is below the sawtooth level, the output of U3 is high, providing a white display. The length of this displayed line ends when the sawtooth exceeds the level at U3 pin 2.

ICs U4 and U5 (an 18-bit shift register of which 16 bits only are used), together with VD and BL pulses, time this display function, i.e., Q5 transistor is turned on first to display CH 1 audio level, then Q5/Q6 are turned off for a few H lines; then Q6 alone is turned on to display CH 2 audio level or battery condition, whichever is selected by SW5 switch. The display function is disabled during BL time and when diodes D1 and D4 are turned on by a low at terminal 10 IND ON/OFF control.

Master pedestal, R/B H CENT, and R/B V CENT are self-explanatory.

4-28 Microphone Amplifier

The microphone amplifier consists of a local 8V regulator, U02, an op-amp amplifier U01 pin 7, and op-amp buffer U01 pin 1. The gain is adjustable using potentiometer R08. If -40 dB normal gain is unnecessary, R01 should be changed to about 1.5 kΩ fixed resistor. Wire jumpers J_A/J_B should be connected only when an electret-type microphone is used. This type microphone needs a dc-voltage and dc-return path to ground, which the two jumpers provide.

4-29 1.5-INCH BLACK AND WHITE VIEWFINDER

The 1.5-in. viewfinder consists of a 9-Vdc regulator, video amplifier, vertical and horizontal deflection circuits, high voltage generator, and indication circuit.

- 9 Vdc regulator: The 12 Vdc supplied at J1 terminal 3 is converted into regulated +9 Vdc by U2 and Q6.
- Video amplifier: The video signal introduced at J1 terminal 1 is buffered by transistor Q1, amplified by transistors Q9 and Q10, and then sent to G1 of the CRT. Potentiometer R41 adjusts contrast. Potentiometer R52 adjusts brightness. Switch S3 is used to emphasize the high-frequency component of the video signal so that apparent resolution increases.

- Vertical and horizontal deflection circuits: Transistors Q2 to Q5 are a sync-splitting circuit. IC U3 includes both vertical and horizontal deflection drive circuits. Transistors Q7 and Q8 provide amplification of vertical deflection. Transistors Q14 and Q15 generate horizontal deflection pulses and drive transformer T1 which generates high voltage. Potentiometer R19 adjusts V HOLD. Potentiometer R25 H HOLD. Potentiometer R36 varies vertical scanning size and potentiometer R37 varies vertical linearity. Inductor L4 adjusts H WIDTH.
- High voltage generator: The signal generated by switching of 9 Vdc is boosted to 6 kV and 1 kV by transformer T1. Potentiometer R67 is used for adjusting the electrical focus.
- Indicator: Transistors Q18, Q19 and diode D14 detect the tape-remaining time signal and light the D104—D106 LEDs. Switch S1 is talent tally control switch. S2 is the video signal, audio signal and BATT indicator control switch.

SECTION 5
MAINTENANCE

5-1 INTRODUCTION

This section contains maintenance information for the ARC-10 portable camera. Figure 5-44, located at the end of the section, is an overall wiring diagram of the ARC-10 system.

5-2 GENERAL NOTES AND PRECAUTIONS

CAUTION

ALWAYS TURN POWER OFF WHEN REMOVING OR RE-INSERTING PRINTED WIRING ASSEMBLIES (PWAs). FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE PWA.

CAUTION

MANY ADJUSTABLE COMPONENTS HAVE BEEN SEALED WITH A SILICON COMPOUND FOLLOWING FACTORY ADJUSTMENT. TO AVOID DAMAGE TO SUCH COMPONENTS, BREAK THE SEAL BEFORE ATTEMPTING ANY ADJUSTMENT.

CAUTION

USE CARE WHEN HANDLING INSULATED GATE (MOS/CMOS) FIELD-EFFECT SEMICONDUCTOR DEVICES IN ORDER TO AVOID DESTRUCTION OR DEGRADATION OF PERFORMANCE AS A RESULT OF STATIC CHARGE BUILDUP. PERSONS HANDLING SUCH DEVICES SHOULD BE GROUNDED USING A CONDUCTIVE WRIST STRAP THAT IS CONNECTED THROUGH A 1 MΩ SERIES RESISTOR TO GROUND. USE GREAT CARE WHEN THE HUMIDITY IS 30% OR LESS AND MAKE SURE ALL LEADS OF THE DEVICE ARE SHORTED TOGETHER (USUALLY BY THE CONDUCTIVE MATERIAL IN WHICH THEY ARE PACKED) UNTIL INSTALLED INTO THE PWA.

Note

Adjustments and test points that are accessible at the PWA edge should be made with the PWA inserted in the card rack.

5-3 RECOMMENDED TEST EQUIPMENT

A listing of test equipment recommended for maintenance of the ARC-10 is given in Table 5-1.

Table 5-1. Recommended Test Equipment

Equipment Type	Suggested Model
Precalibrated monochrome monitor (8-in. or larger screen)	Conrac CNB8 or equivalent
Color monitor	Tektronix 7603 or equivalent
Waveform monitor	Tektronix 528 or equivalent
Vectorscope: NTSC	Tektronix 520,1420 or equivalent
Digital voltmeter (4-1/2 digit)	Fluke 8600 or equivalent
Crosshatch pattern generator (adjustable model, if available)	Tektronix 146 or equivalent
Light meter	Tektronix J16 or equivalent
EIA Registration chart	Ampex P/N 545-193
EIA Linearity chart	
EIA Resolution chart	Ampex P/N 545-194
Window chart	
EIA Logarithmic gray scale chart	Ampex P/N 1402724
Light box	
Audio oscillator	HP 200CD or equivalent
Audio VTVM	HP 400E or equivalent
Lens cleaning solution	Kodak or equivalent
Ac probe	HP 1121A or equivalent
High voltage probe (capable of 20 kV)	Pomona 4242

5-4 PRINTED CIRCUIT BOARD AND CONTROLS LOCATION

The names and locations of the printed ciruit boards located in the camera head are indicated in Figures 5-1 and 5-2. Table 5-2 provides a functional description of the switches and controls located on the camera head PWAs. Figure 5-3 shows the location of the camera's internal switches and controls.

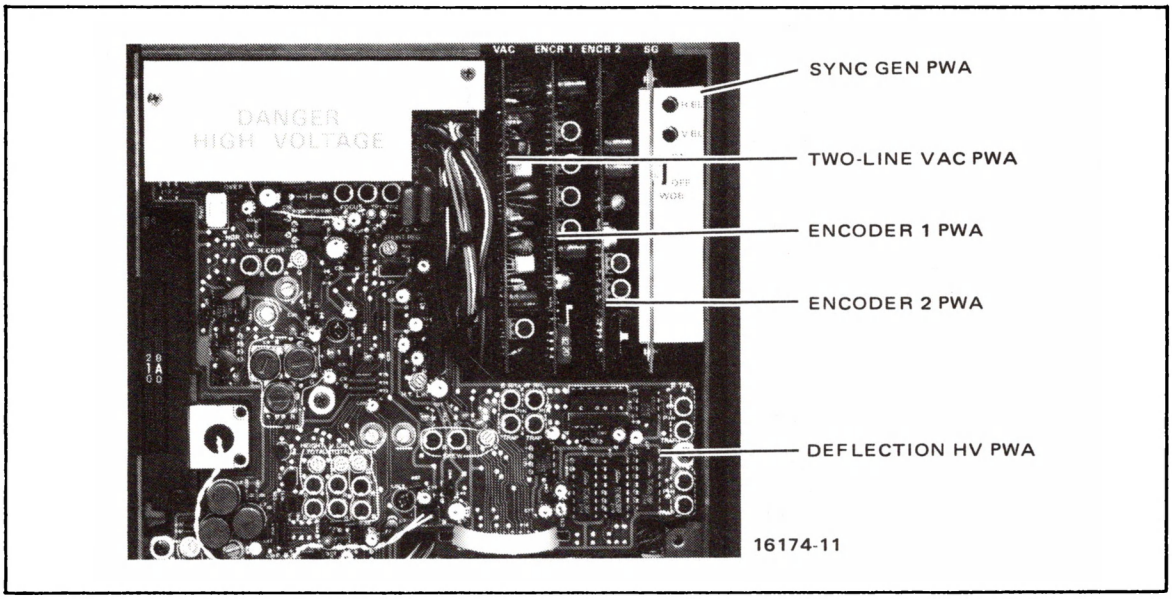


Figure 5-1. Left Side of Camera, Panel Off

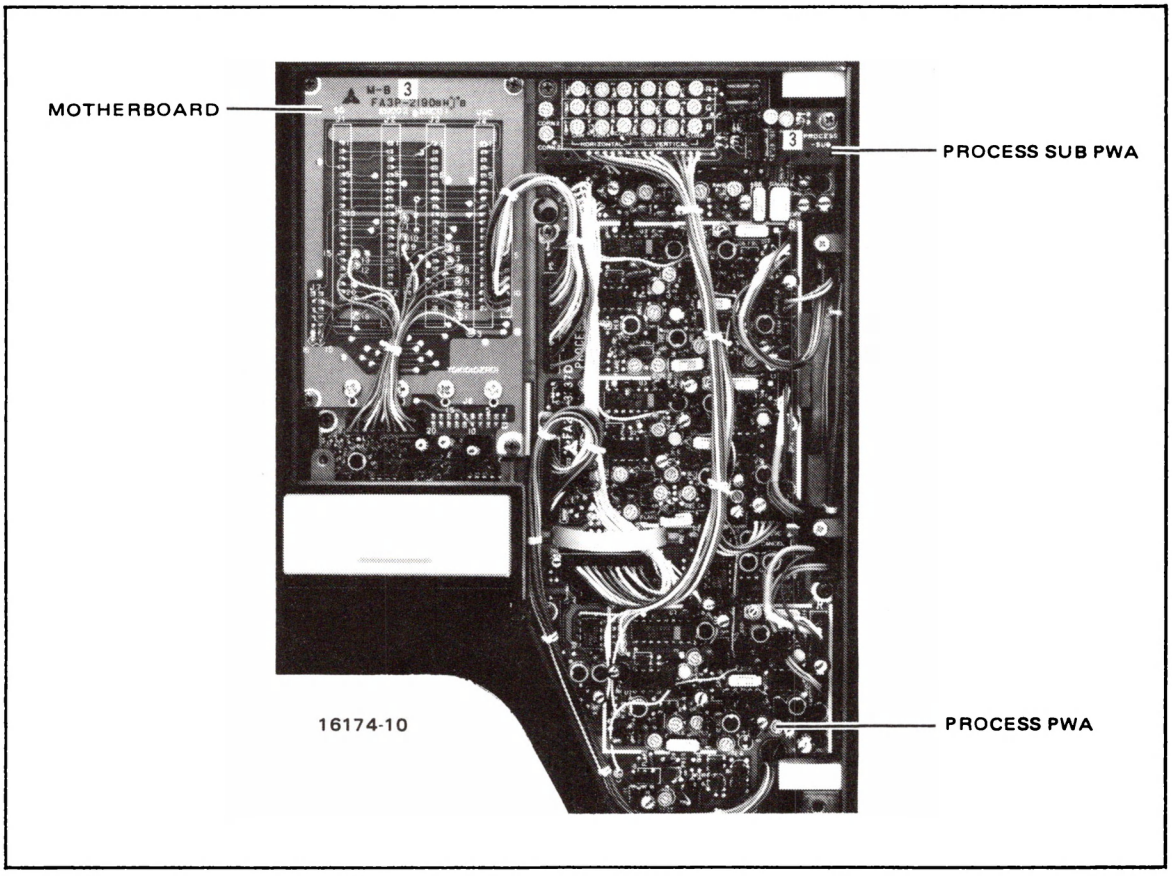
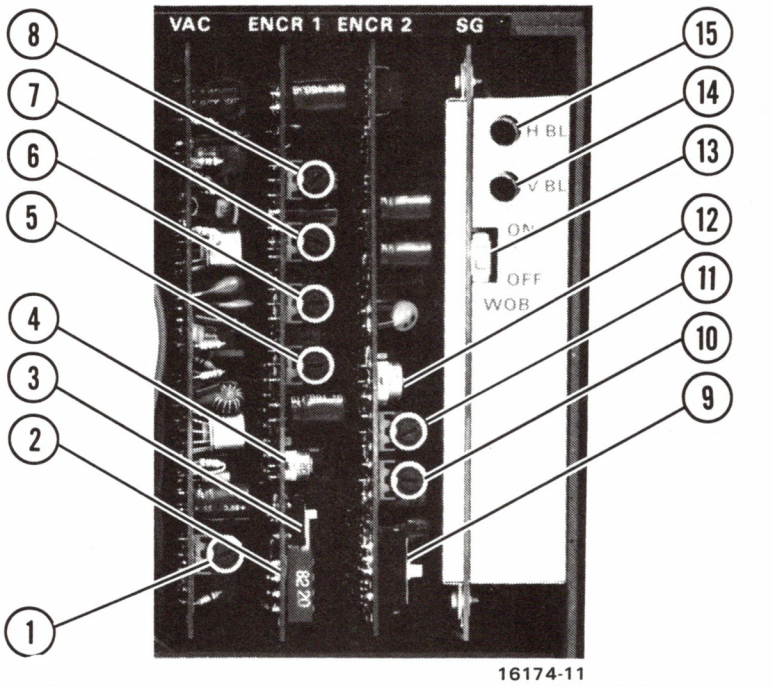


Figure 5-2. Right Side of Camera, Panel Off

Table 5-2. Camera Head PWA Controls and Switches



16174-11

PWA	Index No.	Control/ Switch	Function
Two-Line Vac	1	R75	Adjusts amount of enhancement in high luminance areas of picture.
Encoder 1	2	S2	Color bar ID switch. Identifies camera in color bar signal.
	3	S1	Color matrix switch. Permits color matrixing adjustment for camera matching.
	4	R47	TWQ bar. Adjusts geometry of W and Q bars in color bar signal.
	5	R74	Adjusts white level of I signal.
	6	R59	Adjusts white level of Q signal.
	7	R23	Noise slice. Adjusts level of noise sliced from enhancement.
	8	R25	DTL. Adjusts level of detail enhancement.
Encoder 2	9	S1	Disables I or Q video for test purposes. Center position is normal (I and Q on).
	10	R44	Adjusts Q level for black balancing.

(Continued next page)

Table 5-2. Camera Head PWA Controls and Switches

PWA	Index No.	Control/ Switch	Function
Encoder 2 (Continued)	11	R45	Adjusts I level for black balancing.
	12	R40	Sync level adjustment. Adjust for -40 IRE.
Sync Generator	13	WOB ON-OFF	Turns 30 Hz focus modulation signal on and off. Used during beam alignment.
	14	VBL R01	Adjusts width of vertical blanking interval.
	15	HBL R02	Adjusts width of horizontal blanking interval.

5-5 PREFERENCE ADJUSTMENTS

The following adjustments can be performed at the discretion of the operator.

5-6 Camera Identification

In a multicamera system where several cameras must be matched, there is an identification black patch signal that can be added into the color bar signal. Up to 16 cameras (2^4) may be uniquely identified by the presence or absence of these patches in the G, Mg, R and B bars. These patches are selected by four switches on the Encoder 1 PWA. Two additional jumpers are provided for identification of up to 64 (2^6) cameras. This identification code is also useful for identifying which camera was used to make a tape recording if a short color bar segment is recorded at the beginning of the tape. Figure 5-4 shows the location of the black ID patches in the Gr, Mg, Red and Bl bars of the color bar signals generated by the camera. Identify the camera as follows:

STEP 1 Connect a monitor to the MONI OUT connector beneath the hinged panel on the right side of the camera.

STEP 2 Set the CAM-BARS switch on the left side of the camera to BARS so that the camera produces color bars.

CAUTION

THE DEFLECTION HV PWA MOUNTED INSIDE THE LEFT SIDE COVER OF THE CAMERA GENERATES POTENTIALLY LETHAL HIGH VOLTAGE.

STEP 3 Open camera's left side cover.

STEP 4 See Figure 5-5 and locate camera identification switches on edge of Encoder 1 PWA.

STEP 5 Observe monitor and set camera identification switches for desired camera identification black patches in the color bar display. It is recommended that black patches be set to represent camera's single or double digit identification number in binary code.

STEP 6 Close side panel of the camera.

5-7 Colorimetry Matrix Adjustment

If slightly different colorimetry is required, or if cameras of different types must be matched, the R, G, B (and their complements Cy, Mg, Ye) vectors can be varied up to 10% from standard values using the colorimetry matrix circuit. This circuit can be turned on (up) or off (down) via switch S1 on the Encoder 1 PWA. (See Figure 5-6.) Green is adjusted by potentiometer R6. Red is adjusted by R9, and blue is adjusted by R14. Colorimetry changes do not affect white balance or black/white tracking.

Two jumpers are provided to extend the range of variation of the G and B vectors. The factory-wired positions of these jumpers are indicated in Figure 5-6. To alter vectors, change jumper position as required.

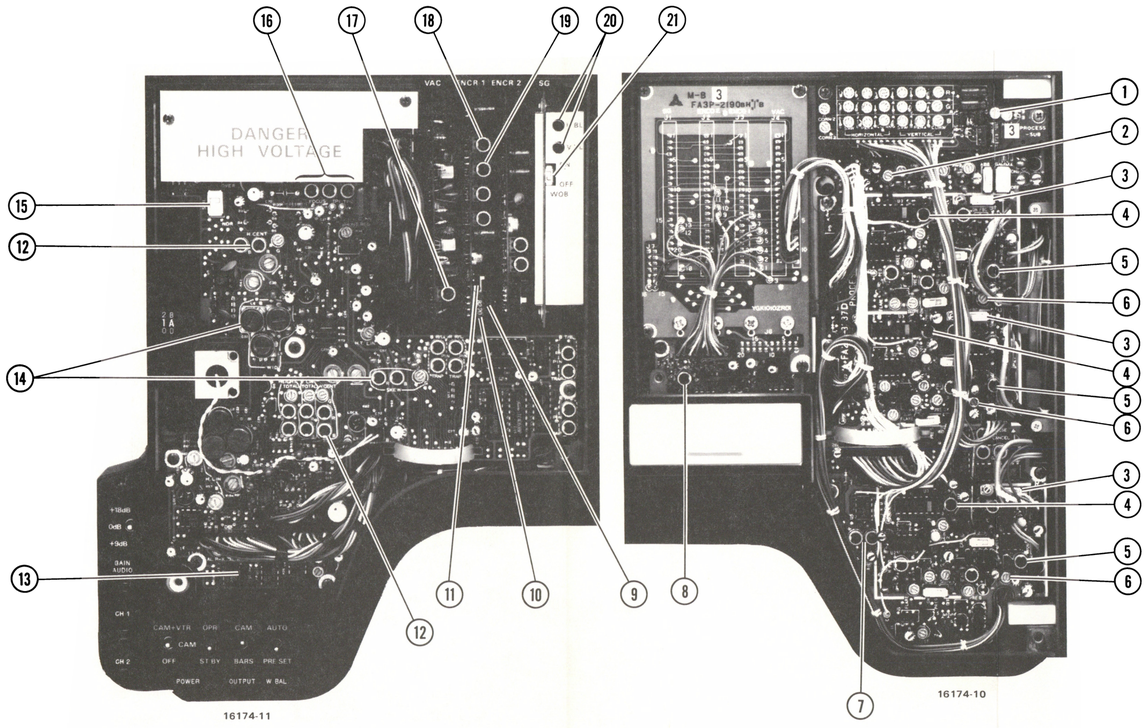
5-8 Black Stretch Adjustment

Black stretch may be required in dark scenes having low contrast. When black stretch is turned on, the contrast at levels below 25 IRE is increased with some sacrifice in signal-to-noise figure. The circuit is activated by a mini-switch located on the motherboard between the Encoder 1 PWA and the Encoder 2 PWA; use a long nonconductive screwdriver to turn on the circuit. Black stretch circuit is enabled when the switch is up and off when switch is down. Black stretch is disabled when the color bars are ON.

5-9 Noise Slice (Coring), Detail Enhancement, and Level-Dependent Detail Enhancement

Detail enhancement is accomplished on the Two-Line Vac PWA. The detail enhancement signal (along with some inevitable noise) is injected into the Encoder 1 PWA to produce a crisper-appearing picture. The amount of enhancement can be increased by the DTL control on the Encoder 1 PWA (see Figure 5-7). Increasing the enhancement level also increases the noise. This noise can be sliced off by the NOISE SLICE control which is factory-set to remove 30% of the noise.

Since our eyes are more sensitive to noise that occurs in the dark portions of a picture, but perceive detail only in well-lighted portions, the detail signal (with the accompanying noise) is normally added only above the 35- to 40-IRE levels. Thus the dark portions of the picture are not contaminated by noise, and enhancement is visible in other picture ranges.



1. **DARK SHADING ADJUSTMENT:** MAKES CLOSED LENS PICTURE UNIFORMLY COLORLESS
2. **GATE ADJUSTMENT:** USED FOR AUTO (IRIS, WHITE, BLACK) SIGNAL, CENTER SAMPLING
3. **FBC SWITCH: ON** NORMAL FOR BETTER HIGHLIGHT HANDLING
   OFF FOR BEAM ADJUSTMENT
4. **WHITE CLIP:** DOES NOT ALLOW SIGNALS GREATER THAN 115 IRE TO REACH OUTPUT
5. **BEAM CURRENT ADJUSTMENT:** TO RESOLVE HIGHLIGHTS WITHOUT FBC ACTION
6. **FBC ADJUSTMENT:** TO RESOLVE EXTREME HIGHLIGHTS
7. **MODULATION SHADING:** REMOVES VERTICAL COLOR NON-UNIFORMITY DUE TO OPTICS
8. **INDICATOR LEVEL:** IDENTIFIES 100 IRE LEVEL IN VF
9. **BLACK STRETCH: OFF** NORMAL (DOWN POSITION).
   ON CONTRAST BETWEEN 7.5 AND 20 IRE INCREASED
10. **COLOR BAR ID SWITCH:** IDENTIFIES CAMERA IN COLOR BAR SIGNAL
11. **COLOR MATRIX SWITCH: OFF** NORMAL POSITION
    ON FOR CAMERA MATCHING
12. **V CENTER:**
    H CENTER: CENTERS THE RASTER IN THE MIDDLE OF TUBE
13. **BEAM ALIGNMENT:** USED WITH WOBBLE SIGNAL TO OBTAIN UNIFORM FOCUS
14. REFER TO ADJUSTMENT PROCEDURE
15. **SCAN SWITCH S1: NOR** NORMAL SCAN
    OVER OVERSCAN
16. **ELECTRICAL FOCUS:** ADJUSTED FOR BEST RESOLUTION
17. **LEVEL DEPENDENT:** ADJUSTS AMOUNT OF ENHANCEMENT IN HIGHLIGHTS
18. **DETAIL ADJUSTMENT:** ADJUSTS TOTAL AMOUNT OF ENHANCEMENT
19. **NOISE SLICE:** REMOVES NOISE FROM ENHANCEMENT
20. **H BL WIDTH:**
    V BL WIDTH: TO CONFORM TO NETWORK REQUIREMENTS
21. **WOB SWITCH: OFF** NORMAL
    ON USED DURING BEAM ALIGHMENT

Figure 5-3.
Camera's Internal Switches and Controls

The LEVEL DPNT (level dependent) control can be used to adjust the noise slice threshold as required. Since a noise level increase accompanies a gain increase, when the +9-dB switch is activated, the threshold is automatically moved to 45 IRE; the +18-dB setting of the video gain switch increases the threshold to 55 IRE.

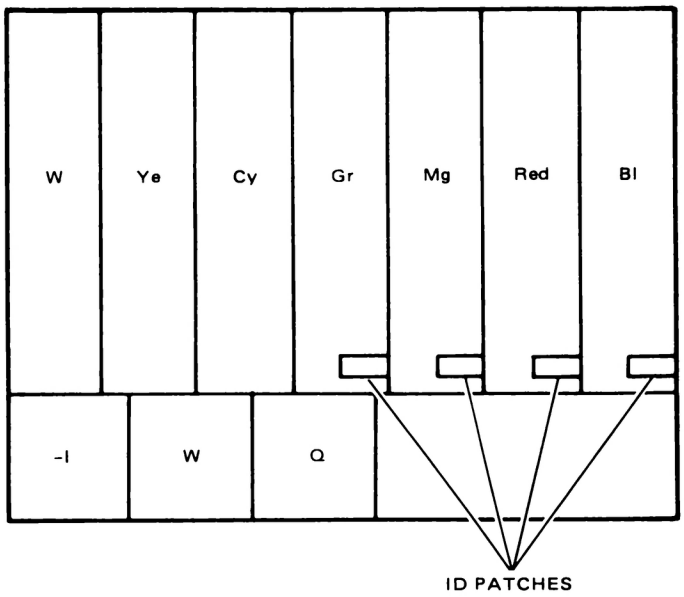


Figure 5-4. ID Patches in Color Bars

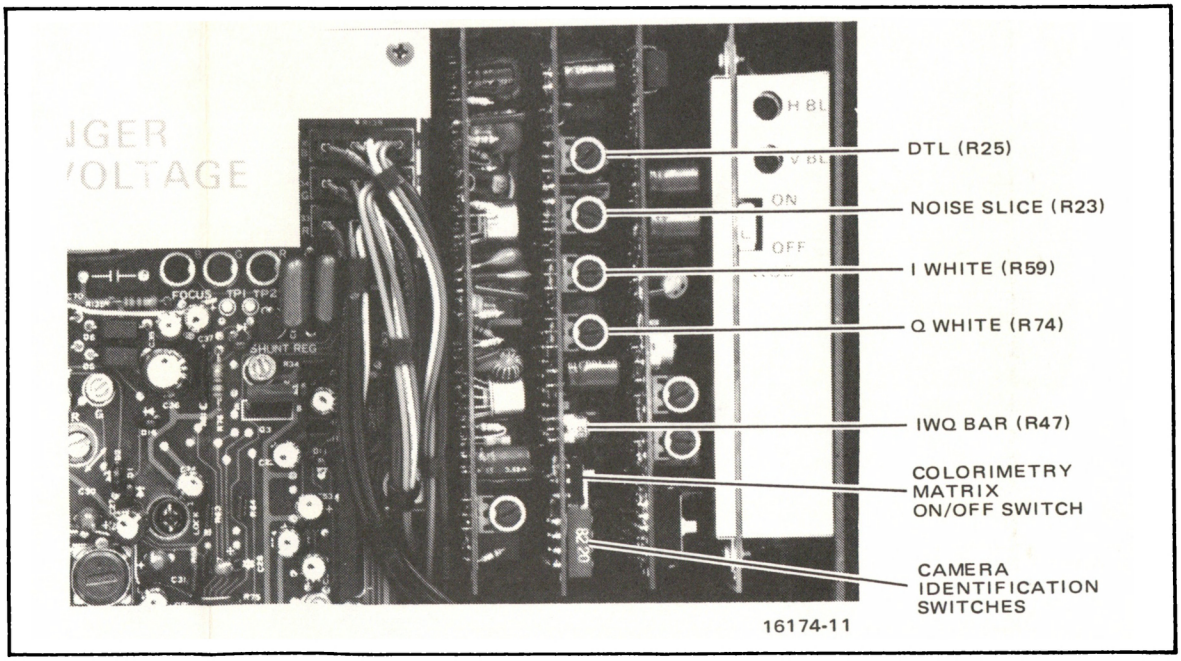


Figure 5-5. Encoder 1 PWA Edge Controls

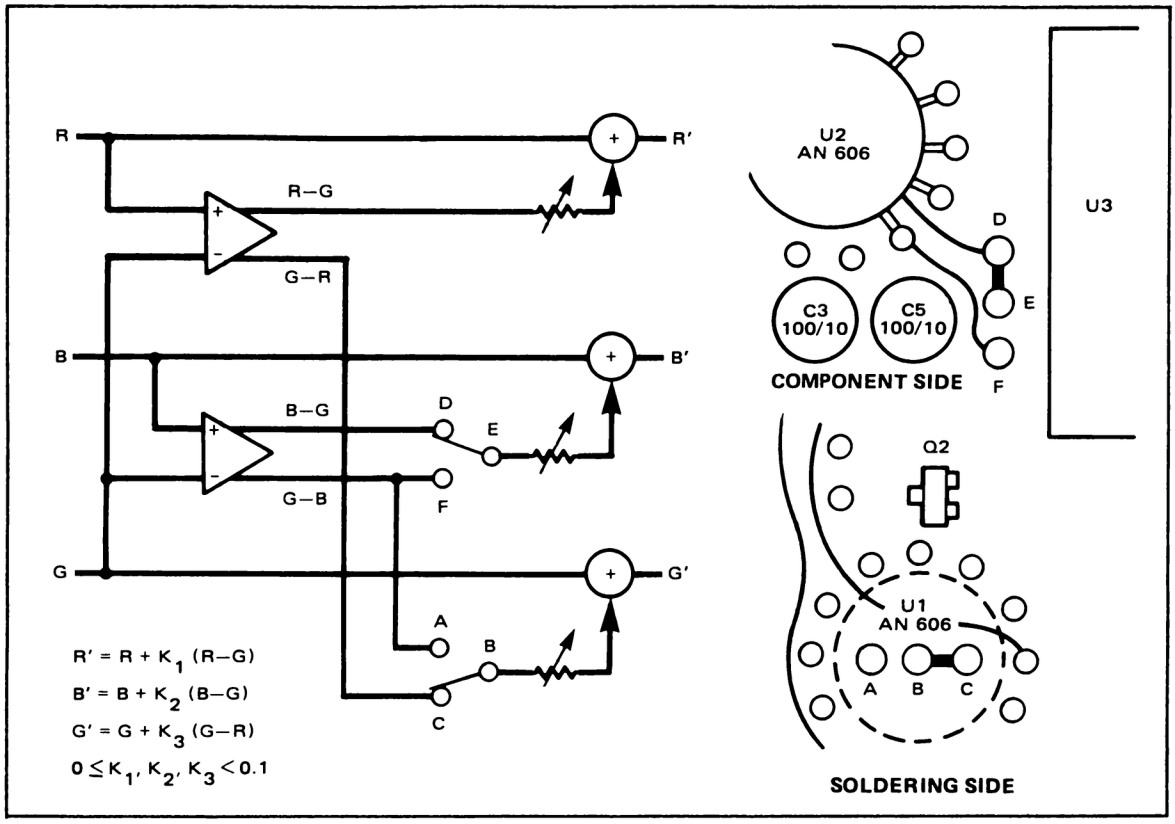


Figure 5-6. Encoder 1 PWA Colorimetry Matrix Circuit

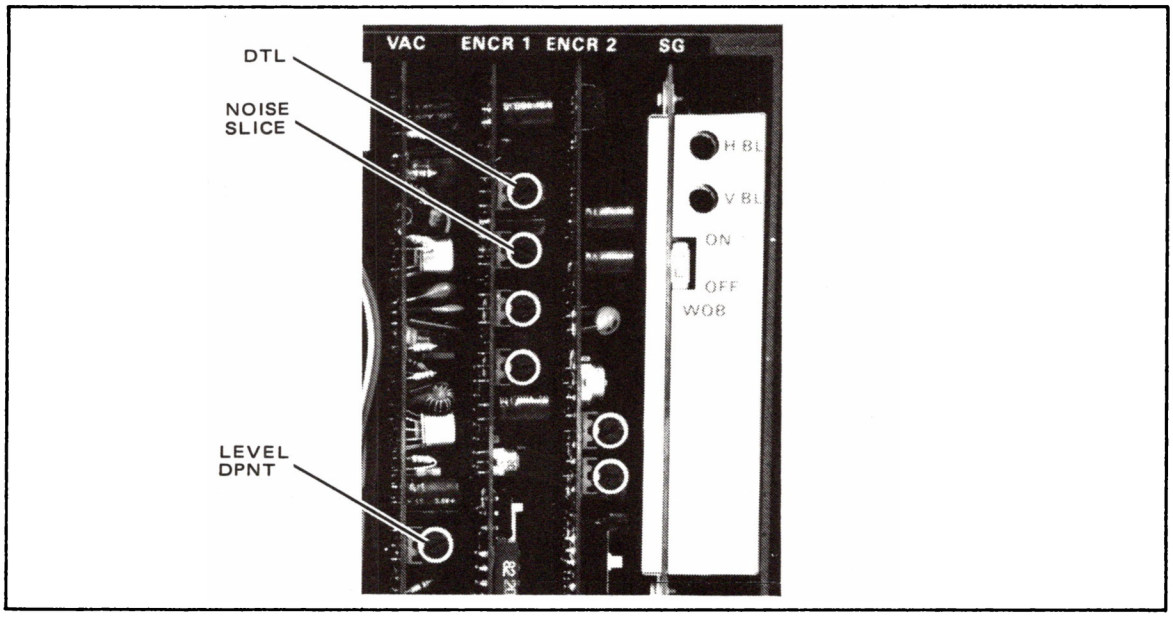


Figure 5-7. Noise Slice (Coring), Detail Enhancement, and Level Dependent Controls

5-10 POWER SUPPLY ADJUSTMENT

Note

If a complete alignment is to be performed, proceed with the power supply adjustment first. If only a portion of the procedure is to be done, check the power supply voltage, but do not adjust unless it is in gross error (±0.1V).

Set the controls as follows:

Controls	Location	Position
Optical Filter		0 Closed (Saticon) 4 Closed (Plumbicon)
CAM+VTR/CAM/OFF switch	Left side of camera	CAM
OPR/ST BY switch		OPR position
EXT/BATT switch		EXT position

5-11 Voltage Adjustment and Confirmation

Test point: Terminal 4 of P12 (+9V) on Deflection HV PWA
Terminal 2 of P12 (+6.3V) on Deflection HV PWA
(These terminals may be covered by a white plastic tab.)
Terminal 4 of P24 (-3.5V) on Process PWA

Adjust: R7(+9V ADJ) on Power Supply PWA (upper access hole on bottom right side of Deflection HV PWA)
R5 (+6.3V ADJ) on Power Supply PWA (Use lower access hole on bottom right side of Deflection HV PWA)

STEP 1 Connect DVM probe to terminal 4 of P12 (+9V) on Deflection HV PWA and adjust potentiometer R7 for +9V ±0.01V (Figure 5-8).

STEP 2 Connect DVM to terminal 2 of P12 (+6.3V) on Deflection HV PWA and adjust R5 for +6.3V ±0.01V (Figure 5-8).

STEP 3 Connect DVM to terminal 4 of P24 (-3.5V) on Process PWA and confirm that voltage is -3.5V ±0.5V.

STEP 4 Set OPR/ST BY switch to ST BY position. At the above check points, confirm that +9V and -3.5V are 0V and that +6.3V is at +2.7V ±0.5V. Also confirm that red LED in viewfinder is on during ST BY.

5-12 SYNC GENERATOR PWA ADJUSTMENT

Turn camera off, remove Sync Generator PWA from the motherboard and insert board extender. Connect Sync Generator PWA on the end of the extender.

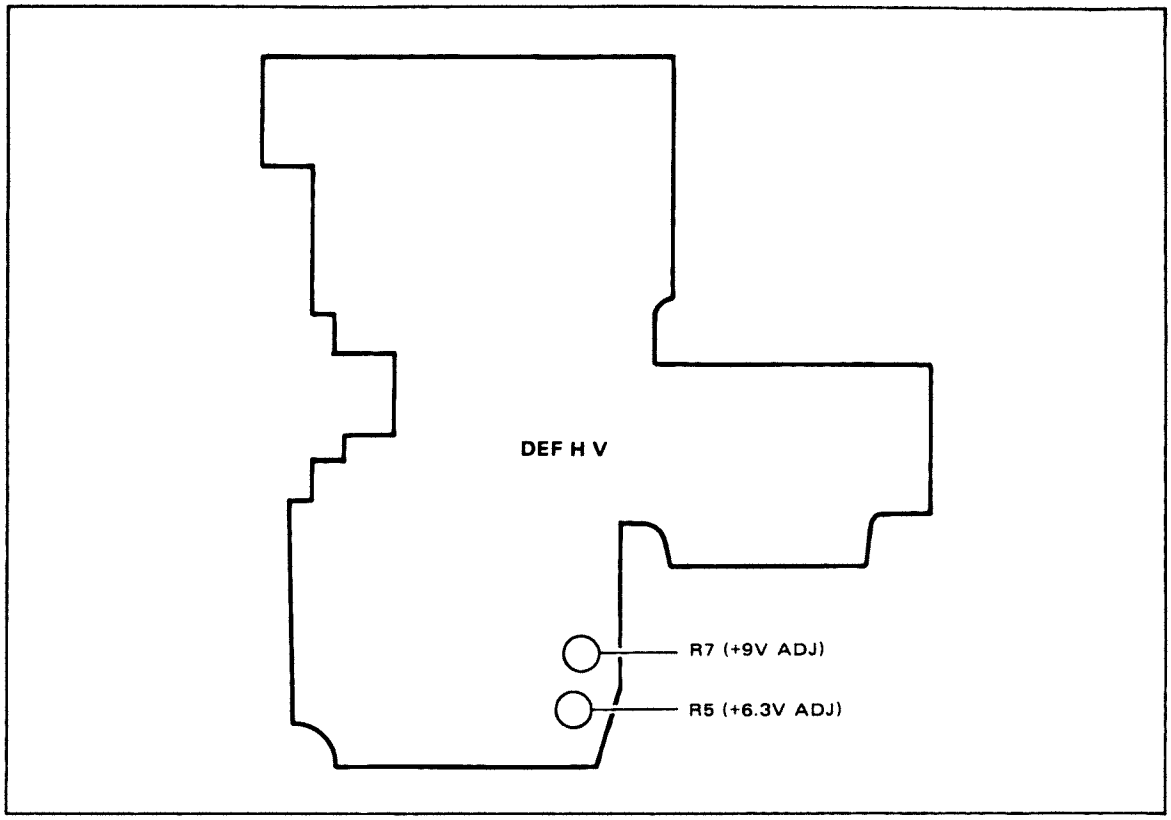


Figure 5-8. Deflection HV PWA

Remove the shields to gain access to all controls.

5-13 Free Running Subcarrier Frequency Adjustment

Test point: Terminal 2 (SC 90°), on Sync Generator PWA

Adjust: VCXO-032 (oscillator unit), on Sync Generator PWA

Connect frequency counter to terminal 2 and adjust variable resistor inside the VCXO-32 oscillator to obtain frequency of 3.579545 ±2 Hz at temperature of 25°C ±5°C. See Figure 5-9.

5-14 Subcarrier and H-Sync Interleave Adjustment

Test point: TP1, Sync Generator PWA

Adjust: L1, Sync Generator PWA

Connect DVM to TP1. Adjust L1 for 4.0V ±0.2V at TP1.

5-15 H BL Width Adjustment

Test point: Terminal 16, on Sync Generator PWA

Adjust: R02 (H BL WID) on Sync Generator PWA

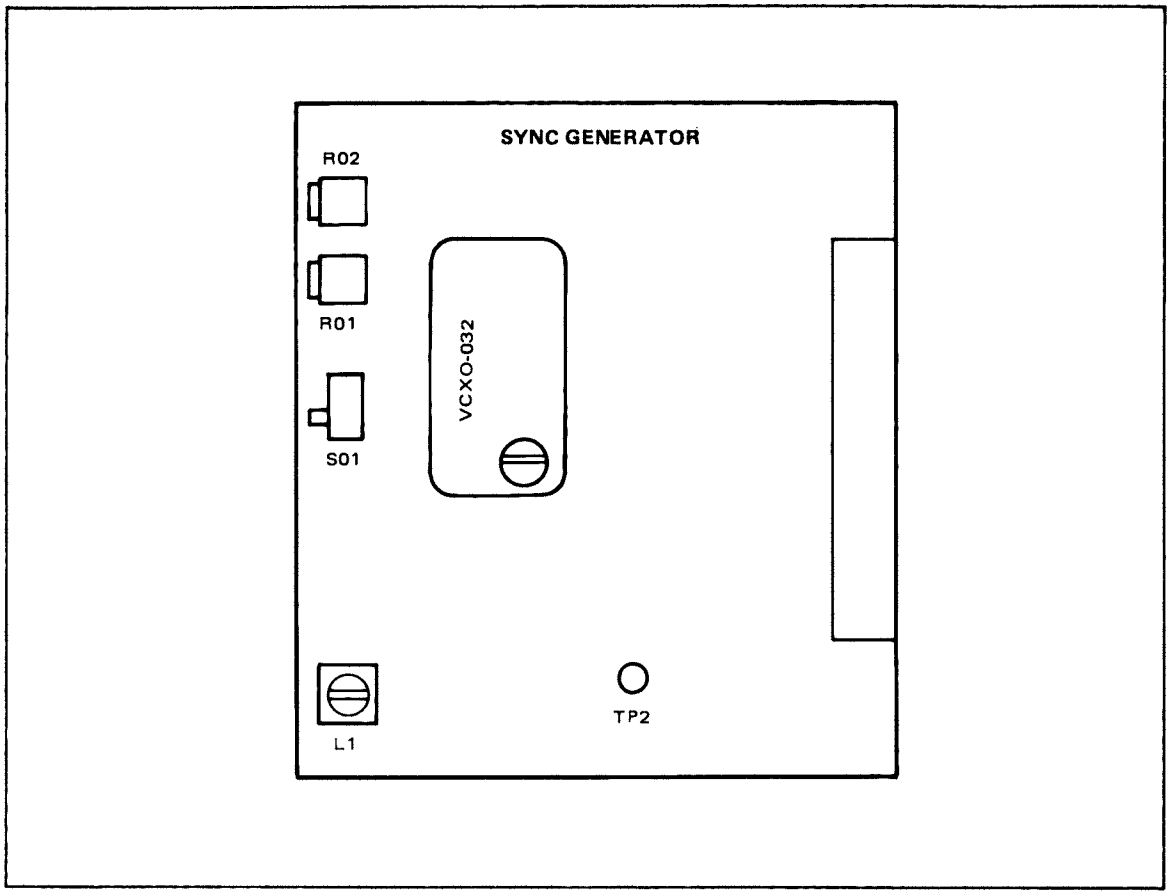


Figure 5-9. Sync Generator PWA

Using an oscilloscope triggered at H rate (use terminal 13 to trigger) adjust R02 (H BL WID) for 10.7-µs pulse width. See Figure 5-10.

5-16 V BL Width Adjustment

Test point: Terminal 16 (E BL) on Sync Generator PWA
Terminal 6 (SYNC) on Sync Generator PWA

Adjust: R01 (V BL WID) on Sync Generator PWA

Using an oscilloscope triggered at V rate (use terminal 15 to trigger), adjust R01 for 19.5H ±0.05H in the vertical interval. Make sure 19.5H is counted correctly irrespective of odd/even field. Observe signals at terminals 16 and 6 together on the scope to facilitate counting. See Figures 5-11 and 5-12.

5-17 Focus Wobbling Signal Confirmation

Test point: Terminal 19 (WOB) on Sync Generator PWA

Confirm that a 30-Hz pulse appears on terminal 19 when switch S01 is ON. Turn switch OFF when finished. Remove the extender board and reinstall the Sync Generator PWA into its proper location.

Note

W HD pulse on terminal 13 is used to generate -3.5V on the Power Supply PWA. Change the normal jumper J2 position if 11.25-µs H BL and 20H V BL straight out of HD44007A chip is required. For a PAL system, change the normal jumper J3 position.

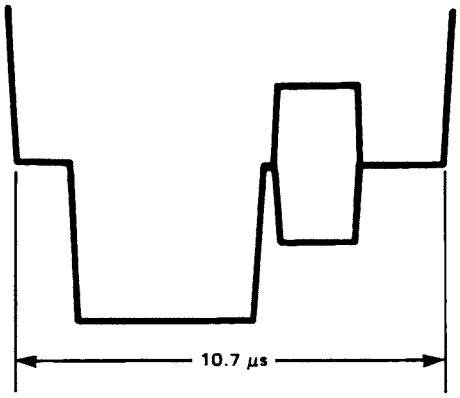


Figure 5-10. Sync Generator H Blanking Width Adjustment

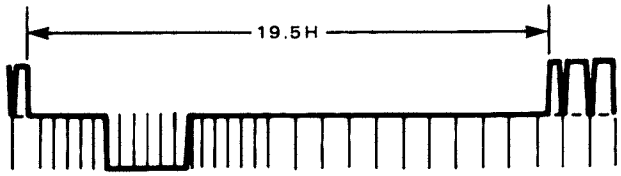


Figure 5-11. Sync Generator V Blanking Width Adjustment

5-18 ENCODER 1 PWA, ENCODER 2 PWA ADJUSTMENT

5-19 Color Bar Width Adjustment

Adjust: R45 (RBG BAR), R47 (I WQ BAR), on Encoder 1 PWA

Observe: Picture monitor

STEP 1 Set CAM+VTR/CAM/OFF switch to OFF position. Remove Encoder 1 PWA from camera and insert extender board. Connect Encoder 1 PWA to extender and reset switch to CAM.

STEP 2 Connect MONI output to color monitor and waveform monitor. Set REGI/ENCR switch to ENCR.

STEP 3 Set CAM/BAR switch to BAR.

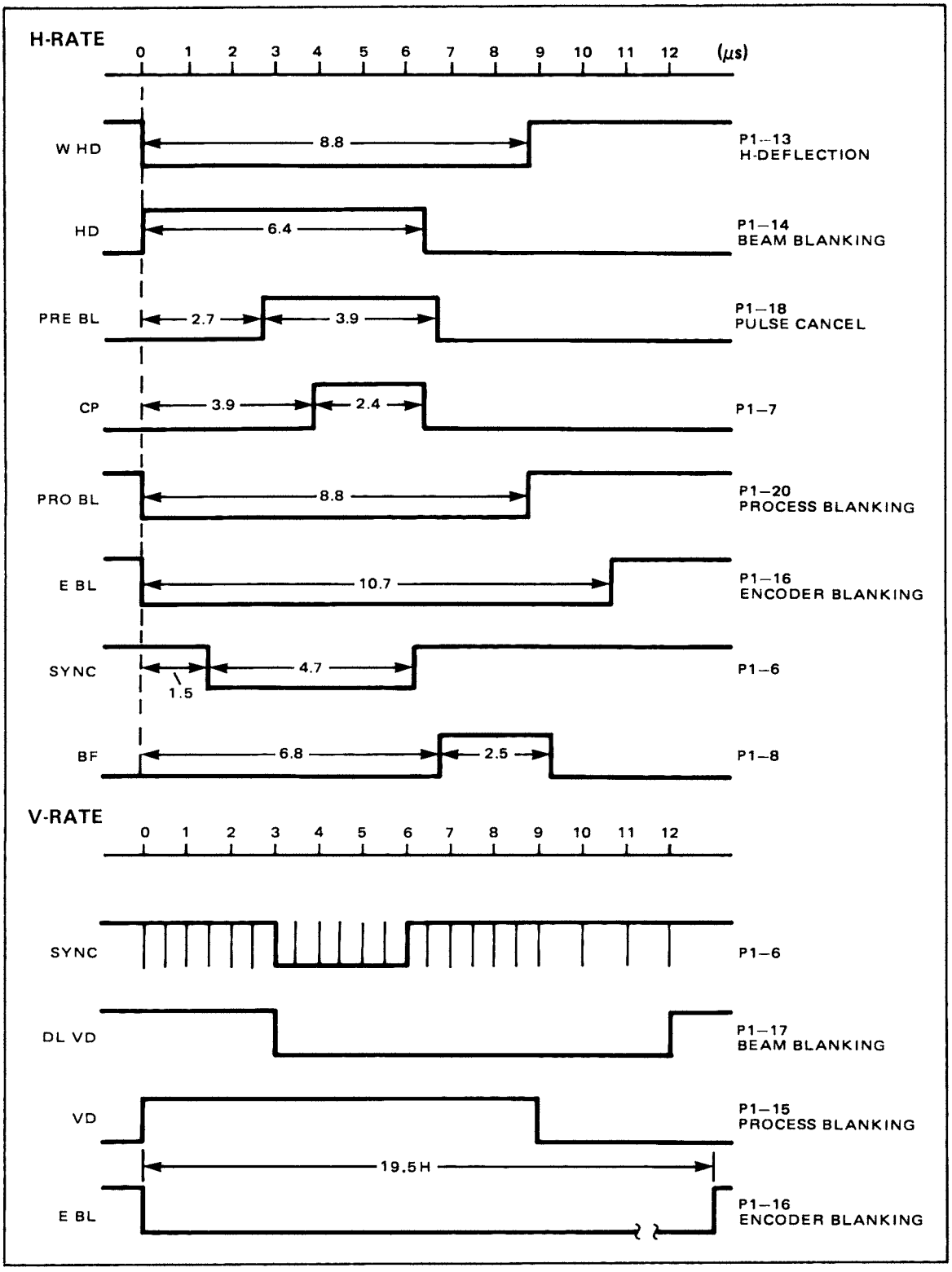


Figure 5-12. Sync Generator PWA Timing Chart

STEP 4 Observe color monitor and adjust R45 (RBG BAR) so that blue color bar width is equal to other color bar widths. There should not be a black bar after the blue bar. See Figures 5-13 and 5-14.

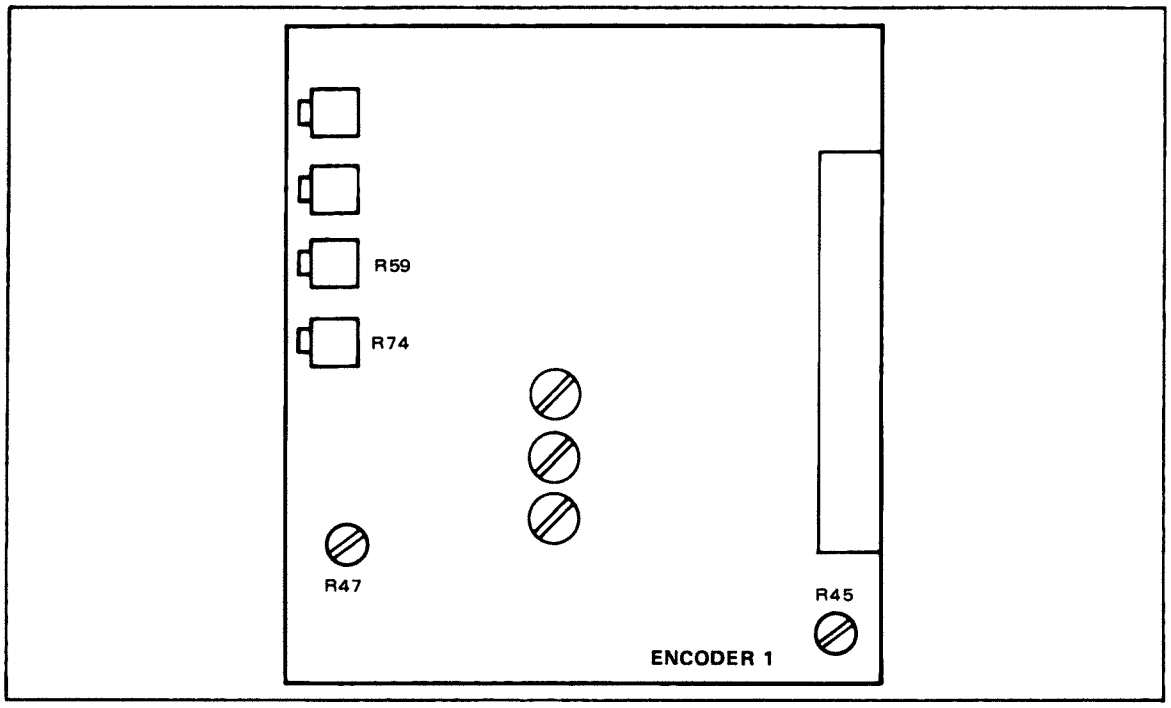


Figure 5-13. Encoder 1 PWA

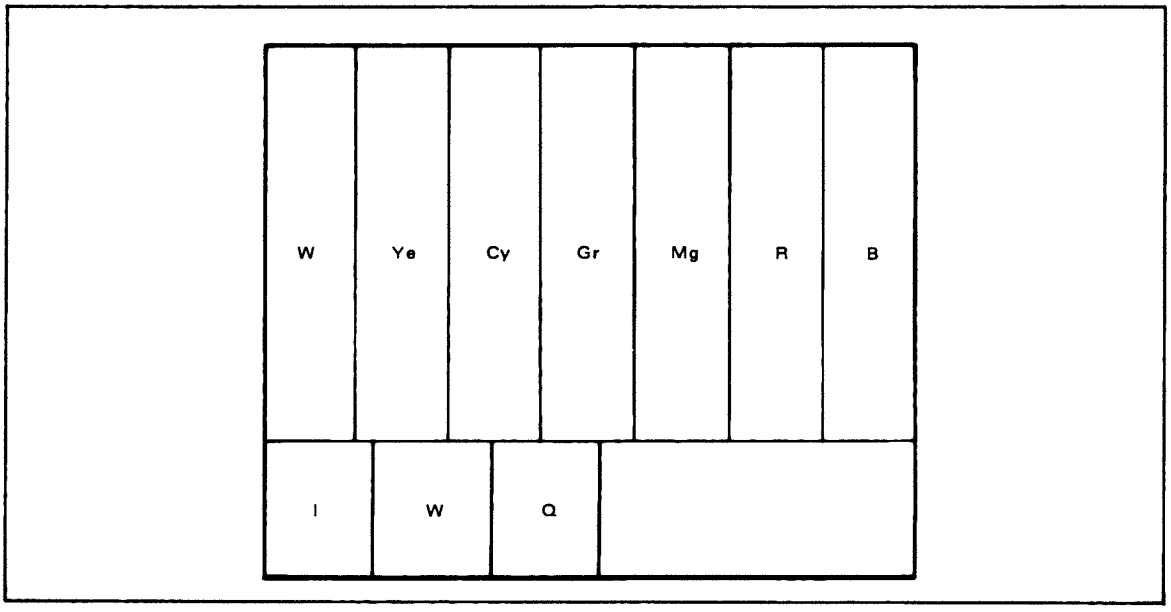


Figure 5-14. Color Bars

STEP 5 Observe color monitor and adjust R47 (I WQ BAR) so that line between W and Q comes to center of cyan bar (Figure 5-15).

STEP 6 Switch off camera, remove extender and reinsert Encoder 1 PWA into camera.

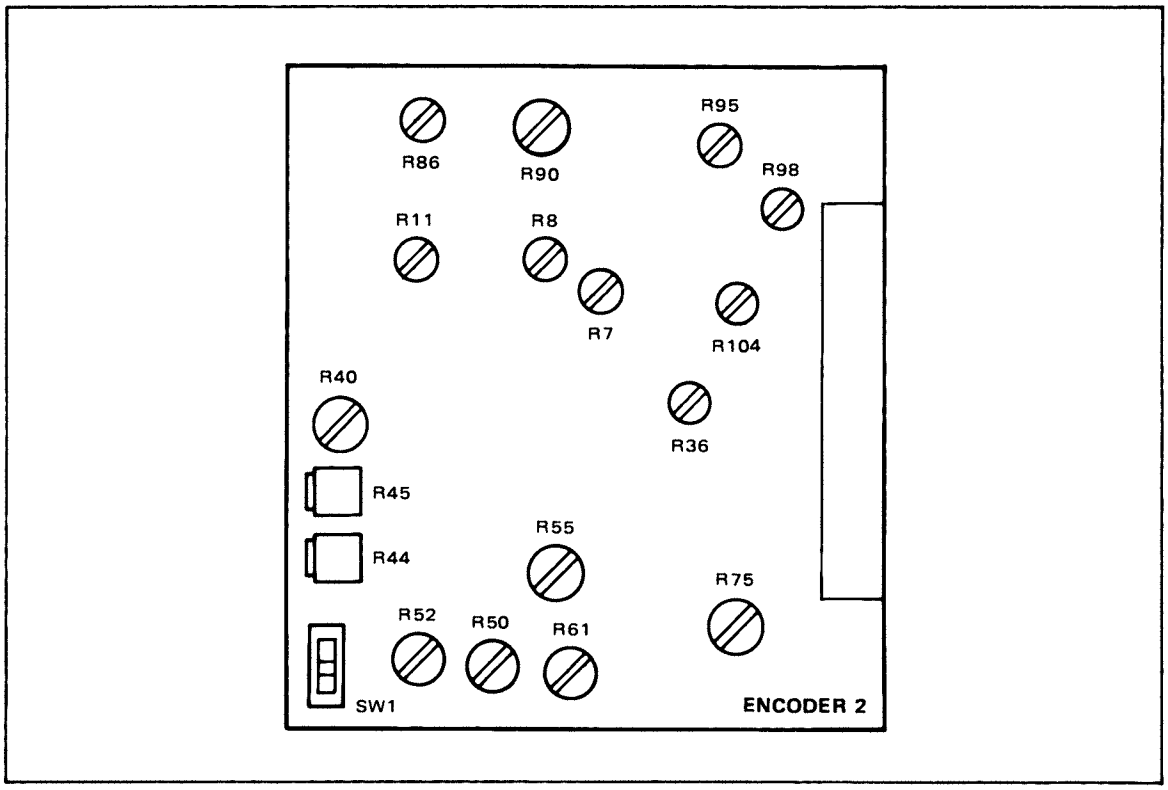


Figure 5-15. Encoder 2 PWA

5-20 Setup, VBS Gain and Sync Level Adjustment

Place Encoder 2 PWA on an extender board.

Adjust: R7 (SET UP), R75 (VBS GAIN), R40 (SYNC LEVEL).

Observe: Waveform monitor

STEP 1 Adjust R11 (WHITE CLIP) fully clockwise and R8 (BLACK CLIP) fully counterclockwise to avoid color bar clipping (normally this step should not be necessary as adjustment is performed by procedures of paragraph 5-66).

STEP 2 Observe NTSC output on waveform monitor and adjust R7 (SET UP) so that the setup is 7.5 IRE (Figure 5-16).

STEP 3 Adjust R75 (VBS GAIN) so that white bar in I/WHITE/Q signal portion is 100 IRE (Figure 5-16).

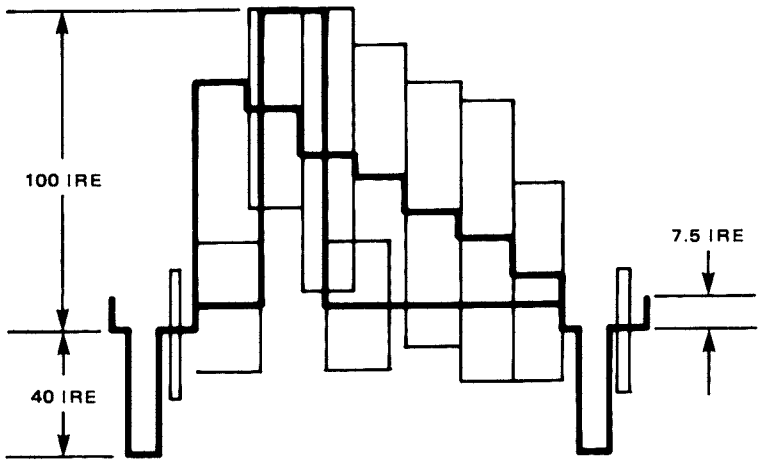


Figure 5-16. NTSC Color Bars

STEP 4 Adjust R40 (SYNC LEVEL) so that the sync level is -40 IRE, repeat steps 1 through 3, if necessary (Figure 5-16).

5-21 Carrier Balance Ajustment

Adjust: R59 (I WHITE), R74 (Q white, on Encoder 1 PWA; R45 (I BLK BAL), R44 (Q BLK BAL), on Encoder 2 PWA.

Observe: Waveform monitor or vectorscope.

STEP 1 Set switch S1 on Encoder 2 PWA to center position (I and Q ON).

STEP 2 Observe waveform monitor or expanded center portion of vectorscope and adjust R45 (I BLK BAL) and R44 (Q WHITE) on Encoder 2 PWA so that subcarrier leakage on I/Q 7.5-IRE setup is minimum.

STEP 3 Adjust R59 (I WHITE) and R74 (Q WHITE) on the front edge of Encoder 1 PWA so that subcarrier leakage on white bar is minimum.

Repeat steps 2 and 3 if necessary.

5-22 QUAD Adjustment

Adjust: R90 (QUAD) on Encoder 2 PWA

Observe: Vectorscope

STEP 1 Connect NTSC output to vectorscope.

STEP 2 Set switch S1 on Encoder 2 PWA to Q position.

STEP 3 Adjust phase of vectorscope display to line up bright spots with the Q axis (Figure 5-17A).

STEP 4 Set switch S1 on Encoder 2 PWA to I position.

STEP 5 Adjust R90 (QUAD) on Encoder 2 PWA so that bright spots line up with I axis. Restore switch S1 to normal middle position (Figure 5-17B).

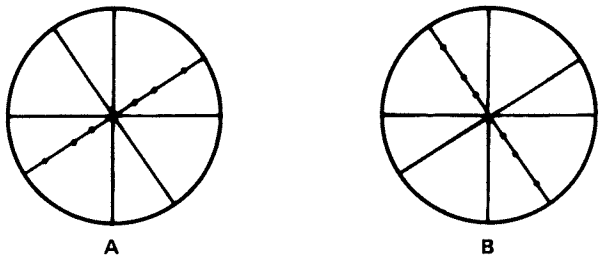


Figure 5-17. Quad Adjustment, Vectorscope Display

5-23 Chroma Gain Adjustment

Adjust: R55 (LEVEL), R61 (Q LEVEL) on Encoder 2 PWA

Observe: Vectorscope

Readjust potentiometers R55 (I LEVEL) and R61 (Q LEVEL) on Encoder 2 PWA to position color vectors in respective boxes on vectorscope display (Figure 5-18).

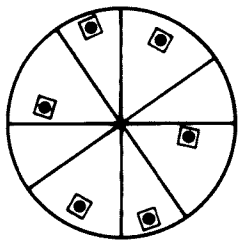


Figure 5-18. Chroma Gain Adjustment, Vectorscope Display

5-24 Burst Phase and Amplitude Adjustment

Adjust: R50 (BURST AMPL), R52 (BURST Φ) Encoder 2 PWA

Observe: Vectorscope

STEP 1 Adjust R52 (BURST Φ) on Encoder 2 PWA until burst phase aligns with B-Y axis and all vectors remain in their boxes (Figure 5-19).

STEP 2 Adjust R50 (BURST AMPL) on Encoder 2 PWA so that burst dot falls on the 75% mark on the B-Y axis (Figure 5-19).

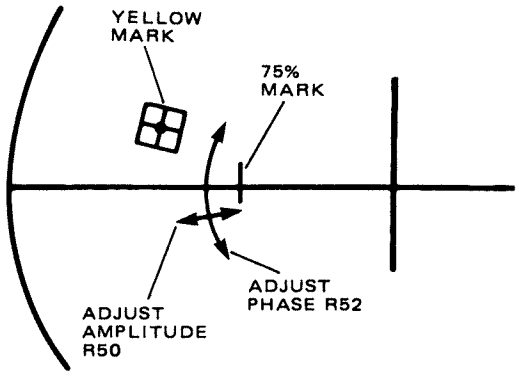


Figure 5-19. Burst Phase and Amplitude Adjustment

5-25 Y-Output and Y-Sync Adjustment

Test point: Terminal 12 (Y OUT) Encoder 2 PWA

Adjust: R36 (Y GAIN), R40 (SYNC LEVEL) on Encoder 2 PWA

Note

If the VTR is disconnected, use a 75Ω 1% resistor to terminate the signal. Insert one end into pin 6 (Y OUT) and the other into pin 5 (Y GND) on the P19 relay (BLUE) connector.

STEP 1 Connect oscilloscope to terminal 12 of Encoder 2 PWA.

STEP 2 Adjust R36 (Y GAIN) so that Y output signal level is 0.714V ±0.007V (excluding sync) (Figure 5-20).

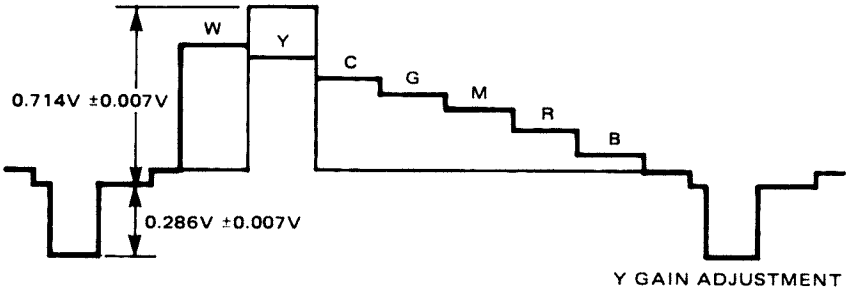


Figure 5-20. Y Gain Adjustment

STEP 3 Adjust R40 (SYNC LEVEL) so that sync level is 0.286V ±0.007V (Figure 5-20).

5-26 Q-Gain Adjustment

Test point: Terminal 11 (Q OUT) on Encoder 2 PWA

Adjust: R104 (Q GAIN) on Encoder 2 PWA

STEP 1 Transfer the 75Ω 1% terminator to pin 8 and pin 7.

STEP 2 Connect an oscilloscope to terminal 11 of Encoder 2 PWA and trigger from Y signal, terminal 12.

STEP 3 Adjust R104 (Q GAIN) so that Q output signal is 0.518 Vp-p ±0.014V (or pin 6 on blue connector) (Figure 5-21).

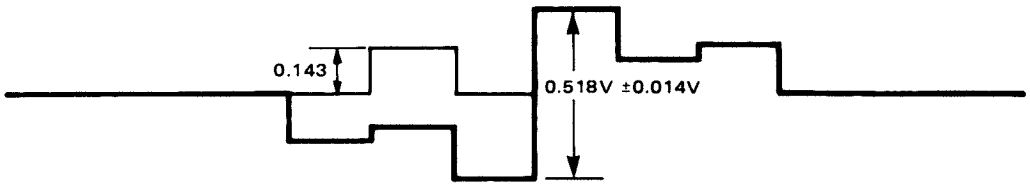


Figure 5-21. Q Gain Adjustment

5-27 I-Output and I-Sync Adjustment

Test point: Terminal 9, (I OUT) on Encoder 2 PWA

Adjust: R98 (I GAIN), R95 (I SYNC LEVEL), on Encoder 2 PWA

STEP 1 Transfer the 75Ω terminator to pins 9 and 10.

STEP 2 Switch the probe from terminal 11 to terminal 9. Trigger from Y signal, terminal 12.

STEP 3 Adjust R98 (I GAIN) so that I output signal is 0.590 Vp-p ±0.014V (excluding sync) (Figure 5-22).

STEP 4 Adjust R95 (I SYNC LEVEL) so that I output sync signal portion is 0.600V ±0.007V (Figure 5-22).

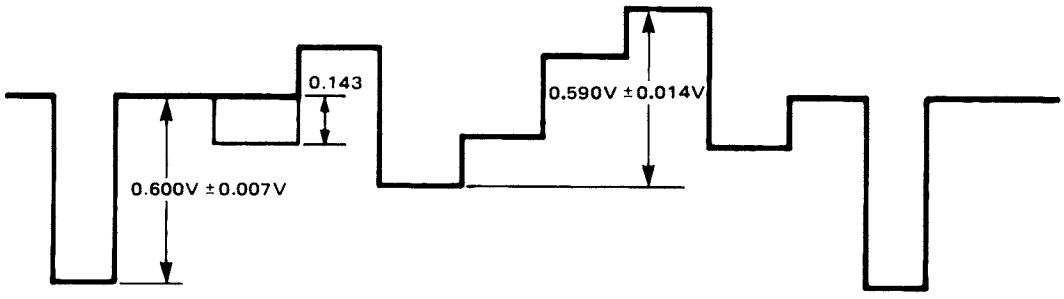


Figure 5-22. I Sync and I Gain Adjustment

5-28 I-Sync Width Adjustment

Test point: Terminal 9 (I OUT) on Encoder 2 PWA

Adjust: R86 (I SYNC WIDTH) on Encoder 2 PWA

STEP 1 Leave scope connected as in previous step and connect another probe to terminal 12 (CH 2 on the scope). Trigger from CH 1.

STEP 2 Compare Y sync width (at terminal 12) and I sync width (at terminal 9). Adjust R86 (I SYNC WIDTH) so that both sync widths are the same.

STEP 3 After this adjustment remove extender and set CAM/BARS switch to CAM.

5-29 PROCESS PWA ADJUSTMENT

Note

In this adjustment a sawtooth test signal is used. The black stretch switch should be off (down position).

Set following potentiometers and switches into positions indicated:

Control	Position	Location
±18, 0, ±9 (Gain)	0	Left side of camera
REGI/ENCR switch	ENCR	Setup panel
S202, S302, S402 (TEST switch)	TEST	Process PWA (See inside of panel for location of controls and switches)
S203, S303,S403 (PRE GAMMA switch)	OFF	
S1 (GAMMA switch)	ON	
R96, R97 (R, B MOD SHAD)	Center	
R234, R334, R434 (KNEE)	Fully cw	
R237, R337, R437 (SLOPE)	Fully ccw	
R239, R339, R439 (PRE GAMMA TRIM)	Center	
R242, R342, R442 (PRE GAMMA ADJ)	Fully cw	
R248, R348, R448 (FLARE)	Fully ccw	
R265, R365, R465 (WHITE CLIP)	Fully cw	
R357 (G PED TRIM)	Center	
S2 (ABB) (Auto-black balance)	OFF	

Note

Remove the Two-Line Vac PWA from camera. Solder a short wire between 4 and 15 on the J4 connector (on the accessible back side of motherboard). This wire must be removed after all of the Process PWA adjustments have been made.

5-30 Test Signal Adjustment

Test point: TP202, TP302, TP402 on Process PWA

Adjust: R61 (TEST GAIN) on Process PWA

Connect scope probe to TP302 and adjust R61 (TEST GAIN) for 0.5 ±0.005-Vp-p sawtooth test signal (see Figure 5-23). Confirm that this amplitude is 0.45 ±0.05V at TP202 and TP402.

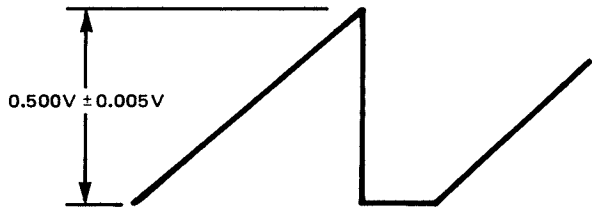


Figure 5-23. Sawtooth Adjustment

5-31 Pedestal and G PED TRIM Adjustment

Adjust: M-PED on setup panel
R257 (R PED), R357 (G PED TRIM) on Process PWA
R457 (B PED) on Process PWA

Observe: ENCR output using waveform monitor

STEP 1 Observe pedestal on waveform monitor and adjust M-PED for 10-IRE units .

STEP 2 Observe waveform monitor and adjust R257 (R-PED) and R457 (B-PED) for minimum carrier leak at pedestal level.

STEP 3 Turn M-PED control on setup panel fully cw. Adjust R357 (G PED TRIM) for minimum carrier leak at pedestal level. Repeat these adjustments a few times.

STEP 4 Adjust M-PED control so that pedestal level is exactly 7.5 IRE. Note that following steps depend on this exact level being set.

5-32 Process Gain 2 Adjustment

Adjust: R263, R363, R463 (R, G, B GAIN 2) on Process PWA

Observe: ENCR output using waveform monitor

Observe test signal on waveform monitor. Adjust R263, R363 and R463 (R, G, B GAIN 2) so that carrier leak of NTSC signal is minimized at the top 100-IRE level Make sure this is adjusted perfectly, as pregamma adjustments can be affected (Figure 5-24).

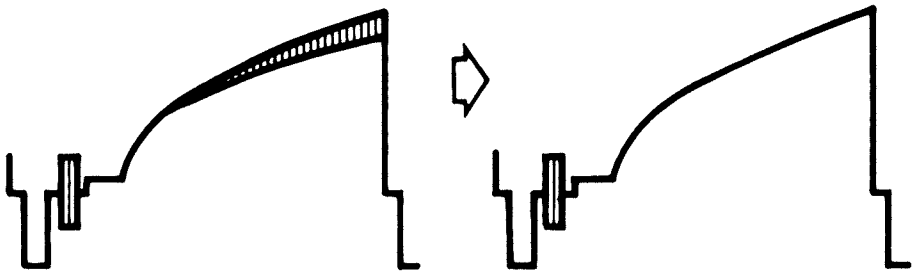


Figure 5-24. Minimum Carrier Leak Adjustment

5-33 Knee and Slope Adjustment

Adjust: R234, R334, R434, (R, G, B KNEE); R237, R337, R437, (R, G, B SLOPE), on Process PWA

Observe: Waveform monitor

STEP 1 Set the 0/+9/+18-dB switch to +9-dB position. Set the S1 GAMMA ON/OFF switch on the Process PWA to OFF.

STEP 2 Connect the scope probe to TP302 and adjust R334 (G KNEE) and R337 (G SLOPE) to obtain the following shape (0.525V ±0.005V corresponds to 105 IRE in ENCR output). (Figure 5-25)

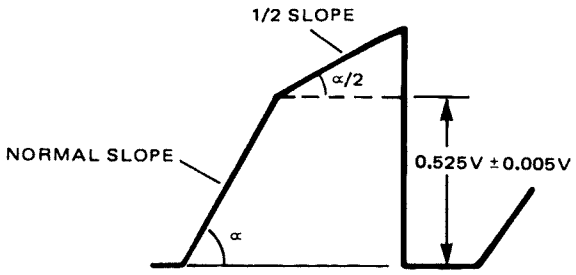


Figure 5-25. G Knee and Slope Adjustment

STEP 3 Observe ENCR output on waveform monitor and adjust R234, R434 (R, B KNEE), and R237, R437 (R, B SLOPE) for minimum carrier leak (Figure 5-26).

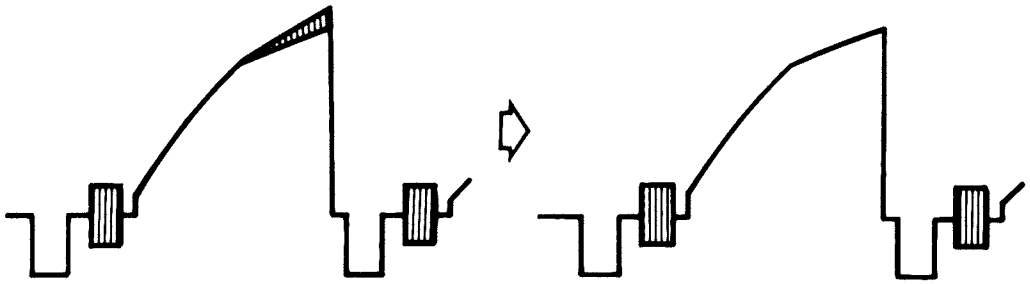


Figure 5-26. R, B Knee and Slope Minimum Carrier Leak Adjustment

5-34 White Clip Adjustment

Adjust: R265, R365, R465 (R, G, B WHT CLIP) on Process PWA

Observe: Waveform monitor

STEP 1 Keep the 0/+9/+18 dB switch set to 9 dB.

STEP 2 Set GAMMA ON/OFF switch S1 to ON. Observe waveform monitor and adjust R265, R365, R465 (R, G, B WHT CLIP) so that the clipping point becomes 115 IRE and the carrier leak becomes minimum at this point (Figure 5-27).

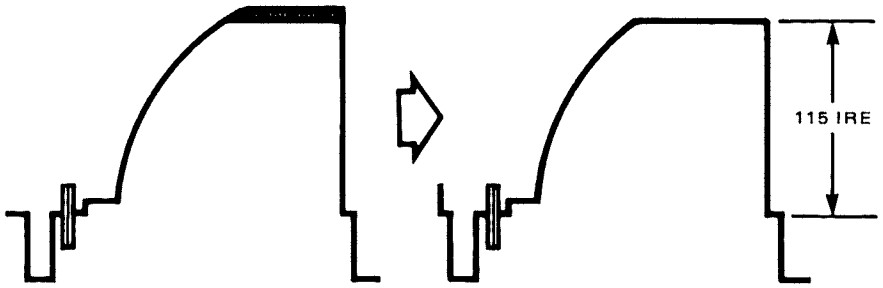


Figure 5-27. White Clip Adjustment

STEP 3 Adjust G WHT CLIP (R365) and then switch waveform monitor to LOW pass position and repeat step 2.

STEP 4 Switch waveform monitor back to normal (flat) position and adjust R and B WHT CLIP to match G, i.e., minimize carrier leak.

5-35 Pregamma Adjustment

Adjust: R239/R242, R339/R342, R349/R442 (R, G, B PRE GAM TRIM/PRE GAM ADJ) on Process PWA

Observe: Waveform monitor

STEP 1 Set switches S203, S303, S403 (PRE GAMMA switches) to ON.

STEP 2 Set the 0/+9/+18-dB switch to 0 and confirm that the peak level is 100 IRE and that the carrier leak is minimum.

STEP 3 Turn R239 PRE GAMMA ADJ fully ccw. Adjust R242 PRE GAMMA TRIM for minimum carrier leak at the top of the test signal only (Figure 5-28).

Similarly adjust green channel using R339/R342 and blue channel using R439/R442. Return PRE GAMMA ADJ potentiometer R239/R339/R439 to center position.

Note

After the Process PWA adjustments have been completed remove the jumper wire between pins 4 and 15 on connector J4.

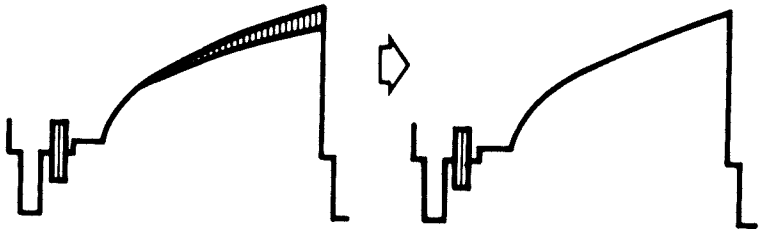


Figure 5-28. Pregamma Trim Minimum Carrier Leak Adjustment

5-36 TWO-LINE VAC PWA ADJUSTMENTS

5-37 28-MHz Frequency Multiplier Tuning Adjustment

Test point: Base of transistor Q2 on Two-Line Vac PWA

Adjust: C4, C6 on Two-Line Vac PWA

STEP 1 Remove Two-Line Vac PWA (Figure 5-29) from motherboard and insert the extender board. Connect Two-Line Vac PWA on the extender.

STEP 2 Connect oscilloscope to the base of Q2 (top center of board) and observe 28-MHz signal.

STEP 3 Adjust capacitors C4 and C6 so that the 28-MHz signal becomes maximum.

5-38 Amplitude Modulation Circuit Tuning Adjustment

Test point: TP1 on Two-Line Vac PWA

Adjust: C10 on Two-Line Vac PWA

STEP 1 Connect oscilloscope to input of delay line (follow the white wire).

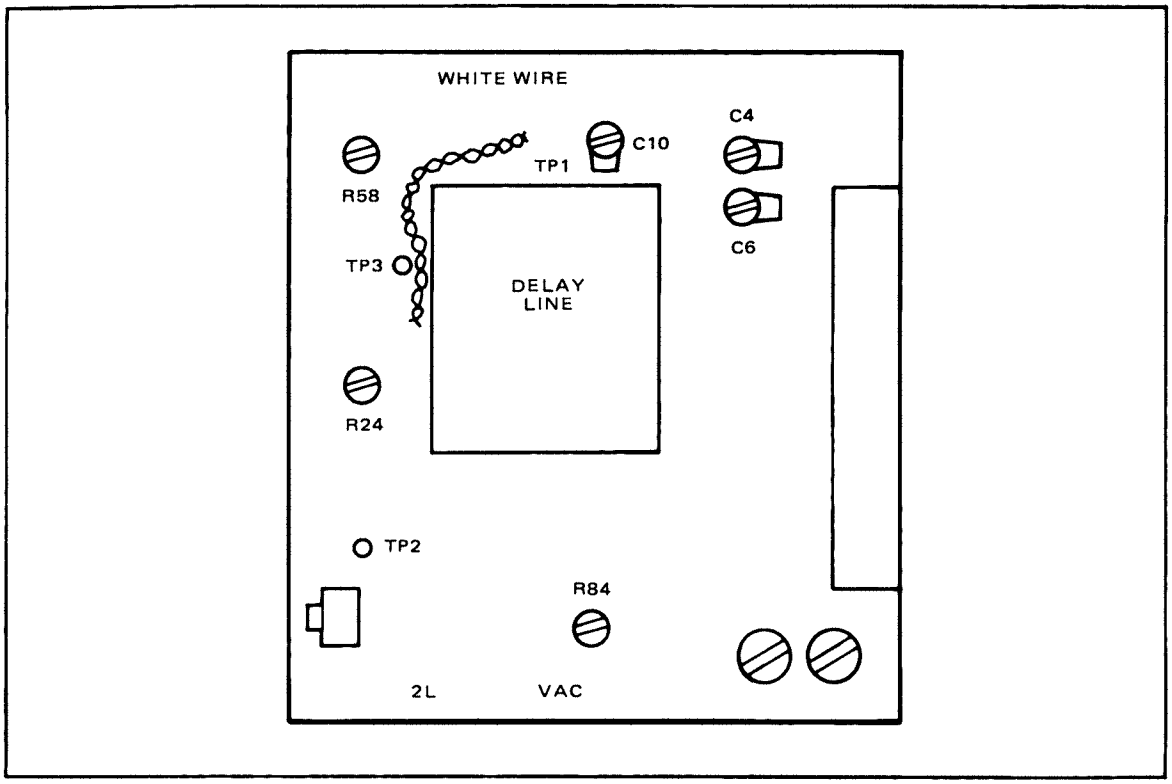


Figure 5-29. Two-Line Vac PWA

STEP 2 Adjust capacitor C10 so that the amplitude of the modulated signal becomes maximum and symmetrical at the same time.

5-39 One-Line AGC Circuit Adjustment

Test point: TP2, on Two-Line Vac PWA

Adjust: R24 (1-line AGC) on Two-Line Vac PWA

Observe: Waveform monitor

Note

Before performing this adjustment, the Process PWA adjustment must be completed.

STEP 1 Set DTL to OFF. This switch is located on the setup panel.

STEP 2 Observe MONI OUT signal on waveform monitor. Adjust potentiometer R24 (1-line AGC) so that leakage at top portion of sawtooth is minimum.

STEP 3 Read peak-to-peak voltage on TP2 (bottom left corner) using an oscilloscope and take note of it for the next adjustment (normally about 1.4V). Take center-to-center readings to mentally eliminate rf carrier from consideration.

5-40 Two-Line Vac Circuit Adjustment

Test point: TP3 on Two-Line Vac PWA

Adjust: R58 (2-line AGC), Two-Line Vac PWA

STEP 1 Observe waveform at TP3. Adjust potentiometer R58 (2-line AGC) so that the amplitude of the sawtooth is equal to the value at TP2 which was noted in last adjustment.

STEP 2 An alternate, more accurate procedure for adjusting R50 is as follows: Connect one probe to TP2 and the other to TP3. Keeping same VOLT/DIV setting on both channels, subtract the waveforms (by inverting and adding on the scope). Adjust potentiometer R58 for waveform balance.

5-41 Detail Balance Adjustment

Test point: Terminal 11 (DTL) on Two-Line Vac PWA

Adjust: R84 (DTL) on Two-Line Vac PWA

STEP 1 Observe waveform at terminal 11 of PWA and adjust potentiometer R84 (DTL) for zero balance. See Figure 5-30.

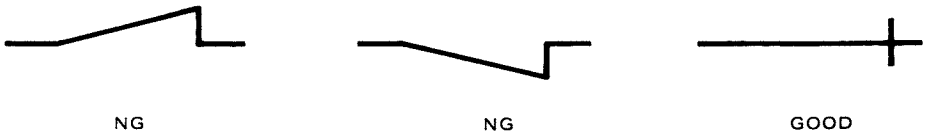


Figure 5-30. Detail Balance Adjustment

STEP 2 Reinstall the Two-Line Vac PWA into its proper position.

5-42 BEAM SETTING

Set controls as follows:

Controls	Position	Location
Optical Filter	1 (Saticon)	On left side of camera
REM/AUTO/MAN (iris control switch)	MAN	On lens
S202, S302, S402 (CAM/TEST switch)	CAM	Process PWA
S201, S301, S401 (FBC ON/OFF switch)	OFF	Process PWA

(Continued next page)

Controls	Position	Location
S1 (NOR/OVER switch)	NOR	Deflection HV PWA
R267, R367, R467 (R, G, B BEAM)	Fully ccw	Process PWA

5-43 Coarse Beam Setting

Test Point: TP202, TP301, TP401 on Process PWA

Adjust: R267, R367, R467 (R,G, B Beam on Process PWA

STEP 1 Aim camera at a resolution chart placed approximately 10 ft or more in front of camera. A star resolution chart, such as that shown in Figure 5-31, is particularly useful when setting focus. Zoom fully out with lens fully open.

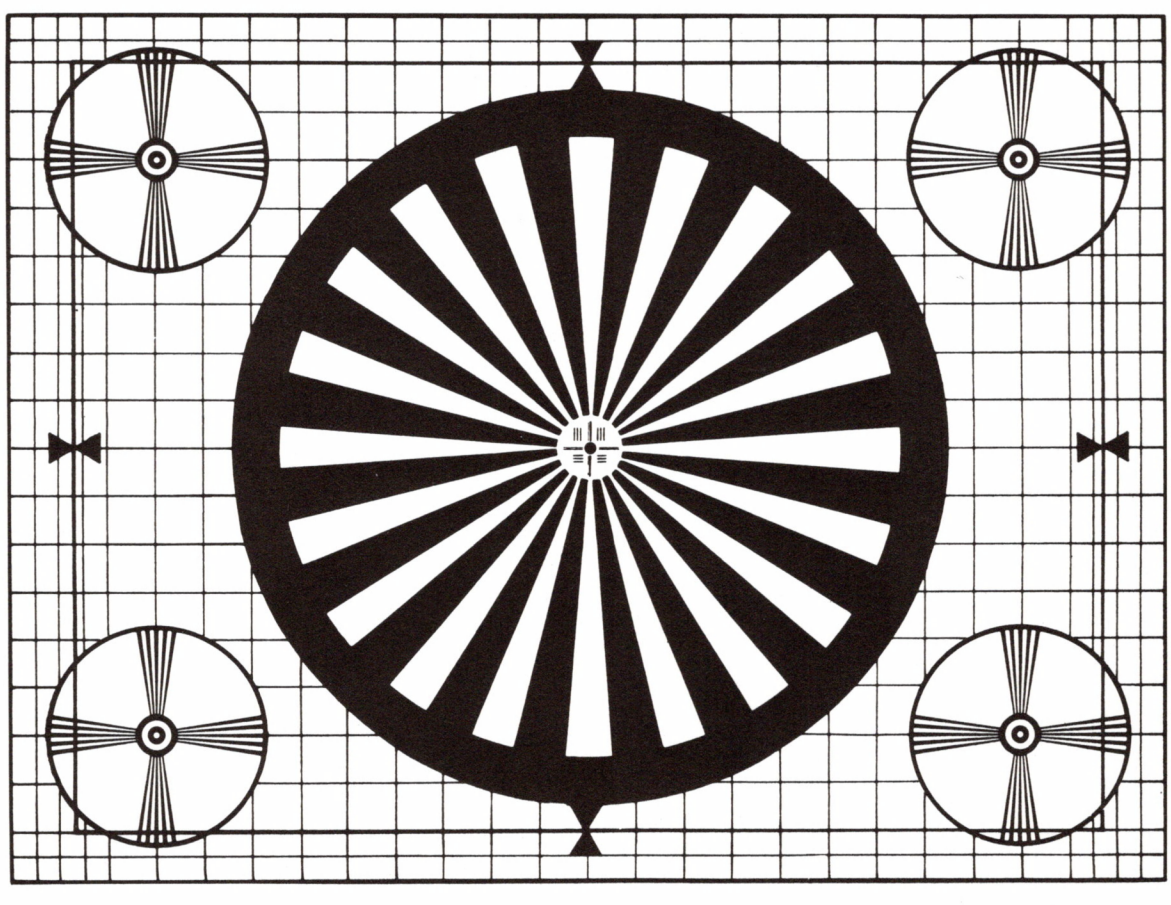


Figure 5-31. Star Resolution Focusing Chart

STEP 2 Connect oscilloscope probe to TP201 and adjust potentiometer R267 (R BEAM) so that the signal level just reaches 0.52 Vp-p. This adjustment is for red beam current. See Figure 5-32.

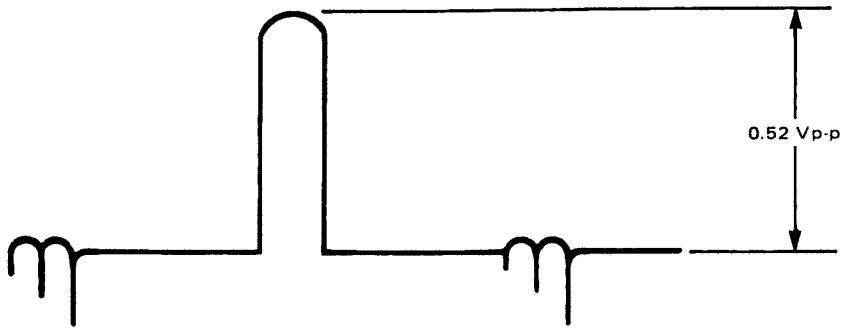


Figure 5-32. R Beam Adjustment

STEP 3 Similarly adjust the green channel using TP301, R367, (G BEAM) and blue channel using TP01, R467 (B BEAM).

5-44 High Voltage Shunt Regulator Adjustment

Test Point: TP1, TP2 on Deflection HV PWA

Adjust: R77 (SHUNT REG) on Deflection HV PWA

Adjust R77 (SHUNT REG) so that the voltage difference between TP1 and TP2 is 8.5 V ±0.3V as read on a DVM. The voltage at TP2 is greater than TP1.

5-45 ELECTRICAL FOCUS ADJUSTMENT (COARSE PREADJUSTMENT)

Set controls as follows:

Controls	Position	Location
REGI/ENCR switch	REGI	Setup panel
R/OFF/B switch	OFF	Setup panel
G/OFF/-G switch	G	Setup panel

Adjust: R131, R133, R129 (R, G, B FOCUS) on Deflection HV PWA

Observe: Monitor

STEP 1 Aim camera at a resolution chart placed approximately 10 ft or more in front of camera.

STEP 2 Adjust lens iris for 70 IRE on waveform monitor.

STEP 3 Adjust potentiometer R133 (G FOCUS) on Deflection HV PWA for best focus.

STEP 4 On setup panel, set R/OFF/B switch to R position and G/OFF/-G switch to OFF position. Adjust lens focus first and then adjust potentiometer R131 (R FOCUS) on Deflection HV PWA for best focus.

STEP 5 Set R/OFF/B switch to B. Adjust lens focus first and then adjust potentiometer R129 (B FOCUS) on Deflection HV PWA for best focus.

5-46 MECHANICAL BACK-FOCUS ADJUSTMENT

Adjust: Green back-focus screw, red back-focus screw, blue back-focus screw. Use access holes on the Deflection HV PWA.

Observe: Monitor

STEP 1 Reduce illumination so that lens iris can be fully opened without signal clipping. Open iris fully. Set G/OFF/-G switch to G. Set R/OFF/B switch to OFF.

STEP 2 Zoom in on any detailed object 2m to 2.5m away from the lens and adjust lens focus.

STEP 3 Unlock green tube locking screw (Figure 5-33). Zoom out and adjust the tube position for best focus, using the green back focus screw shown in Figure 5-33.

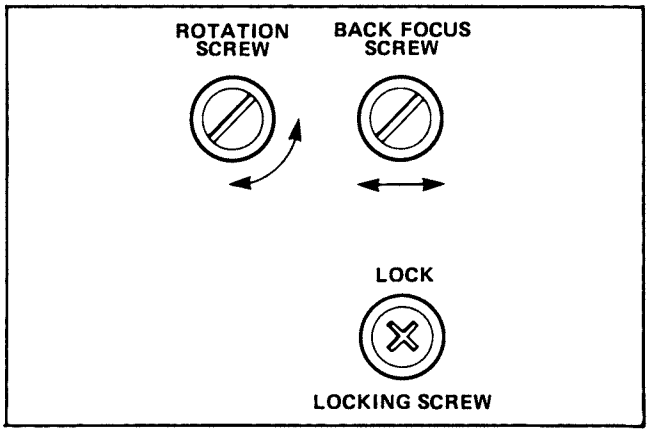


Figure 5-33. Green Focus Adjustment Screws

STEP 4 Repeat steps 2 and 3 several times. Stop when focus tracks over the entire zoom range. When focus-tracking adjustment is complete, do not tighten locking screw.

STEP 5 Set the R/OFF/B switch to R and the G/OFF/-G switch to OFF. Adjust red back-focus in same manner as green back-focus adjustment.

STEP 6 Set the R/OFF/B switch to B. Adjust blue back-focus similar to green back-focus adjustment.

5-47 PICTURE SIZE AND CENTERING ADJUSTMENT

Prepare camera for picture size and centering adjustment by setting controls as follows:

Controls	Position	Location
REGI/ENCR switch	REGI	Setup panel
R/OFF/B switch	OFF	Setup panel
G/OFF/-G switch	G	Setup panel
S1 (NOR/OVER switch)	OVER	Deflection HV PWA

5-48 Green Picture Size and Centering

Adjust: R101 (G V CENT), R52 (G H CENT), R165 (TOTAL HEIGHT) on Deflection HV PWA

Observe: B/W monitor

STEP 1 Set CAM+VTR/CAM/OFF to OFF. Remove connectors J23 (R PRE AMP), J25 (B PRE AMP) on Process PWA.

STEP 2 Set CAM+VTR/CAM/OFF to CAM. Shoot an EIA resolution chart mounted on a piece of cardboard larger by 6.7%, as shown in Figure 5-34.

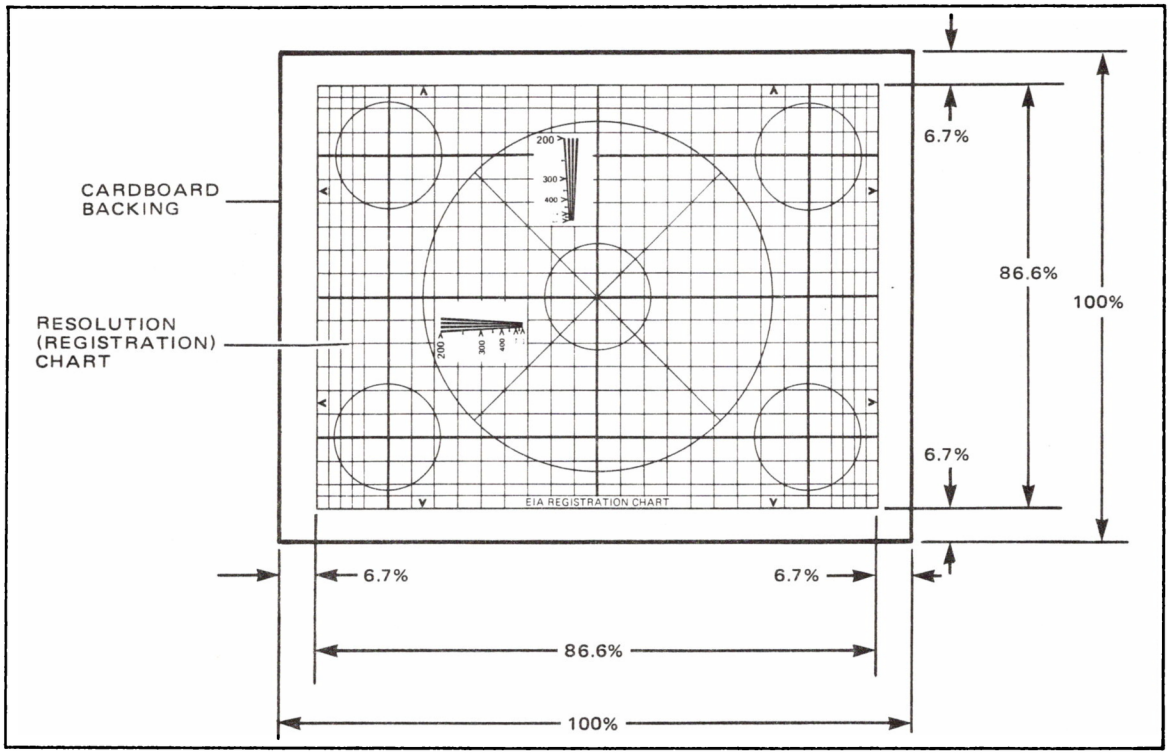


Figure 5-34. Mounted Resolution Chart

STEP 3 Using a B/W or color underscanned monitor, adjust lens iris for 90 IRE on waveform monitor. Set REGI/ENCR switch to ENCR. Aim camera at chart and adjust zoom lens and camera position so that edges of chart touch the pickup tube edges as shown in Figure 5-35A.

STEP 4 Set scan switch to NOR position on Deflection HV PWA. Adjust R52 (G H CENT) and lens zoom to obtain picture shown in Figure 5-35B. (This is only for horizontal size adjustment.)

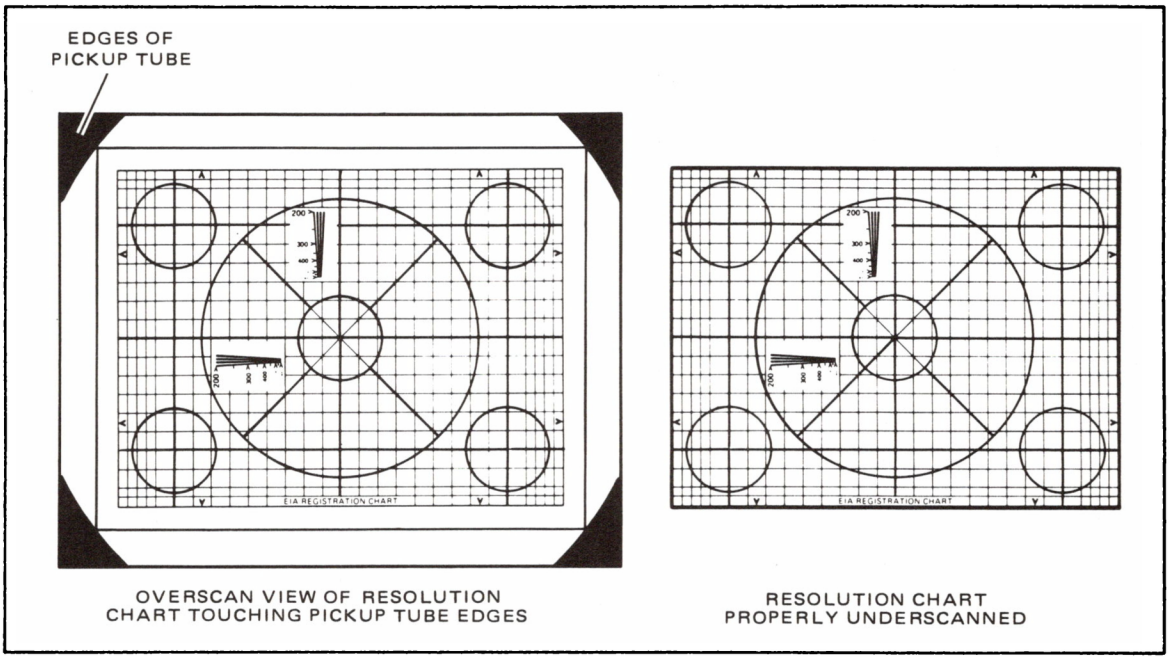


Figure 5-35. Camera Centering Using Resolution Chart

STEP 5 Adjust potentiometer R101 (G V CENT) and potentiometer R165 (TOTAL HEIGHT) on Deflection HV PWA to obtain a correctly framed picture in the raster (Figure 5-35B). Do not move camera position as yet.

5-49 Red and Blue Picture Size and Centering Adjustment

Set controls as follows:

Controls	Position	Location
REGI/ENCR switch	REGI	Setup panel
R/OFF/B switch	R	Setup panel
G/OFF/-G switch	-G	Setup panel
R H CENT control	Center	Setup panel
R V CENT control	Center	Setup panel

(Continued next page)

Controls	Position	Location
B H CENT control	Center	Setup panel
B V CENT control	Center	Setup panel

Adjust: R100 (R V CENT), R99 (B V CENT), R51 (R H CENT), R50 (B H CENT), R161 (R HEIGHT), R158 (B HEIGHT), L5 (R WIDTH), L6 (B WIDTH)

All controls are located on Deflection HV PWA.

STEP 1 Set CAM+VTR/CAM/OFF to OFF. Reconnect J23 (R PRE AMP) and J25 (B PRE AMP) on Process PWA. Then set CAM+VTR/CAM/OFF switch to CAM position.

STEP 2 Adjust potentiometers R100 (RV CENT) and R161 (R HEIGHT) so that red height/center matches green. Adjust potentiometer R51 (R H CENT) and coil L5 (R WIDTH) to match R width/center to green (coarse adjustment).

STEP 3 Set R/OFF/B switch on the setup panel to B. Adjust potentiometers R99 (B V CENT) and R158 (B HEIGHT) as well as potentiometer R50 (B H CENT) and coil L6 (B WIDTH) to match the blue raster to the green (coarse adjustment).

5-50 BEAM SETTING AND BEAM ALIGNMENT

Repeat beam setting procedure of paragraph 5-42. Set the REGI/ENCR switch to ENCR. During this precise setting procedure, reduce the iris from fully open to the exact position at which the highlight from light box is just resolved.

Repeat the electrical focus adjustment given in paragraph 5-45.

Beam alignment: Set controls as follows:

Controls	Position	Location
REGI/ENCR switch	REGI	Setup panel
R/OFF/B switch	OFF	Setup panel
G/OFF/-G switch	G	Setup panel
S1 (WOB switch)	ON	Sync Generator PWA

Adjust: R25 (G X ALIGN), R21 (R Y ALIGN), R29 (G Y ALIGN), R3 (B X ALIGN), R17 (R X ALIGN), R12 (B Y ALIGN)
All controls are located on Defletion HV PWA

Observe: Waveform monitor and B/W monitor

STEP 1 Shoot registration chart either at normal 200-fc illumination or in light box fully and correctly framed in the raster. Adjust lens iris so that video level is 70 IRE on waveform monitor.

STEP 2 Observe B/W monitor and adjust potentiometers R25 (AL G-X) and R29 (AL G-Y) so that center line crossover does not move.

STEP 3 Set G/OFF/-G switch to OFF. Set R/OFF/B switch to R. Observe B/W monitor and adjust potentiometers R17 (AL R-X) and R21 (AL R-Y) so that center line crossover does not move.

STEP 4 Set R/OFF/B switch to B. Observe B/W monitor and adjust potentiometers R3 (AL B-X) and R12 (AL B-Y) for same condition as in previous step.

STEP 5 Set G/OFF/-G switch to G. Set R/OFF/B switch to OFF. Set WOB switch to OFF. Set REGI/ENCR switch to ENCR. Turn off camera and remove J23 (R PRE AMP) and J25 (B PRE AMP) on Process PWA.

STEP 6 Turn on camera and observe the G raster on the B/W monitor. If it changed position, readjust G V CENT (R101) and G H CENT (R52) as necessary.

STEP 7 Match R and B centers to the G raster by reconnecting preamps one by one.

Note

Beam aligment may change raster centering and/or rotation. Readjust only H or V centering as necessary at this time.

5-51 FBC ADJUSTMENT

Set controls as follows:

Controls	Position	Location
S201, S301, S401 (R, G, B FBC switch)	ON	Process PWA
R271, R371, R471 (R, G, B FBC)	Fully cw	
AUTO/MAN/REM switch	MAN	On lens
Lens iris	Close	On lens

Testpoint: TP201, TP301, TP 401 on Process PWA

Adjust: R271, R371, R471, (R, G, B, FBC on Process PWA)

STEP 1 Zoom out on light box and remove all slides.

STEP 2 Place scope probe on TP301 (green PRE-AMP output). Open lens iris until level at TP301 is 0.260 Vp-p (approximately f/5.6). If this level cannot be attained, use a higher-intensity light source.

STEP 3 Place scope probe on TP201 (red) and TP401 (blue). Do not measure iris at this time. Measure levels at these two points and take note; these levels are around 0.100 Vp-p.

STEP 4 Place scope probe on TP301. Open iris until level at TP301 is 2.08 Vp-p (this is eight times 0.26 Vp-p). Adjust potentiometer R371 (G FBC) so that clipping occurs at 2.08 Vp-p at TP301. This sets the range of FBC in green channel.

STEP 5 For red channel FBC adjustment, use potentiometer R271 (R FBC) and observe TP201. For blue channel adjustment use potentiometer R471 (B FBC) and observe TP401. Assure that clipping points are eight times greater than the value previously noted. For example, 8 x 0.1 = 0.8 Vp-p (see Figure 5-36).

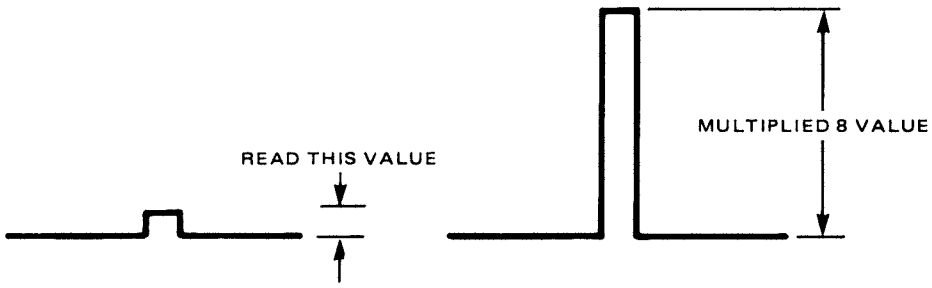


Figure 5-36. FBC Adjustment

STEP 6 As a final test, pan camera across this high intensity light source to make sure that highlight tail is white. Adjust appropriate FBC potentiometer as necessary to make it white.

Note

During above adjustment of FBC, iris may be manually adjusted up and down to locate top of FBC range more precisely, as in the normal beam setting procedure.

5-52 LINEARITY AND SKEW ADJUSTMENT

Set controls as follows:

Controls	Position	Location
R/OFF/B switch	OFF	Setup panel
G/OFF/-G switch	G	Setup panel
REGI/ENCR switch	ENCR	Setup panel

5-53 Rotation of Coil Assembly

Adjust: Green rotation screw and green back-focus on the optics.

Observe: B/W monitor

STEP 1 Turn camera power off and disconnect R, B preamps (J23, J25 on the Process PWA).

STEP 2 Turn on camera power. Shoot the EIA linearity chart and frame it so it occupies entire raster. Adjust iris for 70-IRE level on waveform monitor.

STEP 3 Connect Tektronix 142 crosshatch generator and genlock it to camera output. Feed both camera signal and Tektronix 142 output to same input on B/W monitor. Use tee connector if necessary. Position vertical and horizontal lines of cross hatch pattern on Tektronix 142 to be coincident with lines in the middle of the EIA linearity display. Tilt camera stand if necessary.

STEP 4 Turn rotation screw until EIA chart horizontal middle lines are parallel (or coincident) with the horizontal crosshatch line (also in middle of raster).

5-54 Linearity and Skew Adjustment

Adjust: R115 (HT LIN) R154 (TOTAL V LIN)
R165 (TOTAL HEIGHT) R174 (G SKEW)

All controls are located on Deflection HV PWA

Observe: B/W monitor

Note

Keep connectors J23 (R PRE AMP), J25 (B PRE AMP) disconnected on the Process PWA.

STEP 1 Zoom, tilt, pan, and focus camera so that chart arrows just touch sides of raster. Adjust potentiometers R115 (H.T LIN), R165 (TOTAL HEIGHT), R154 (TOTAL V LIN) R174 (G SKEW), and also vertical horizontal position of crosshatch pattern on generator to align each circle with each crosspoint of the crosshatch. If necessary, zoom out or in to achieve this. See Figure 5-37.

STEP 2 Reconnect J23 (R PRE AMP) and J25 (B PRE AMP) on Process PWA.

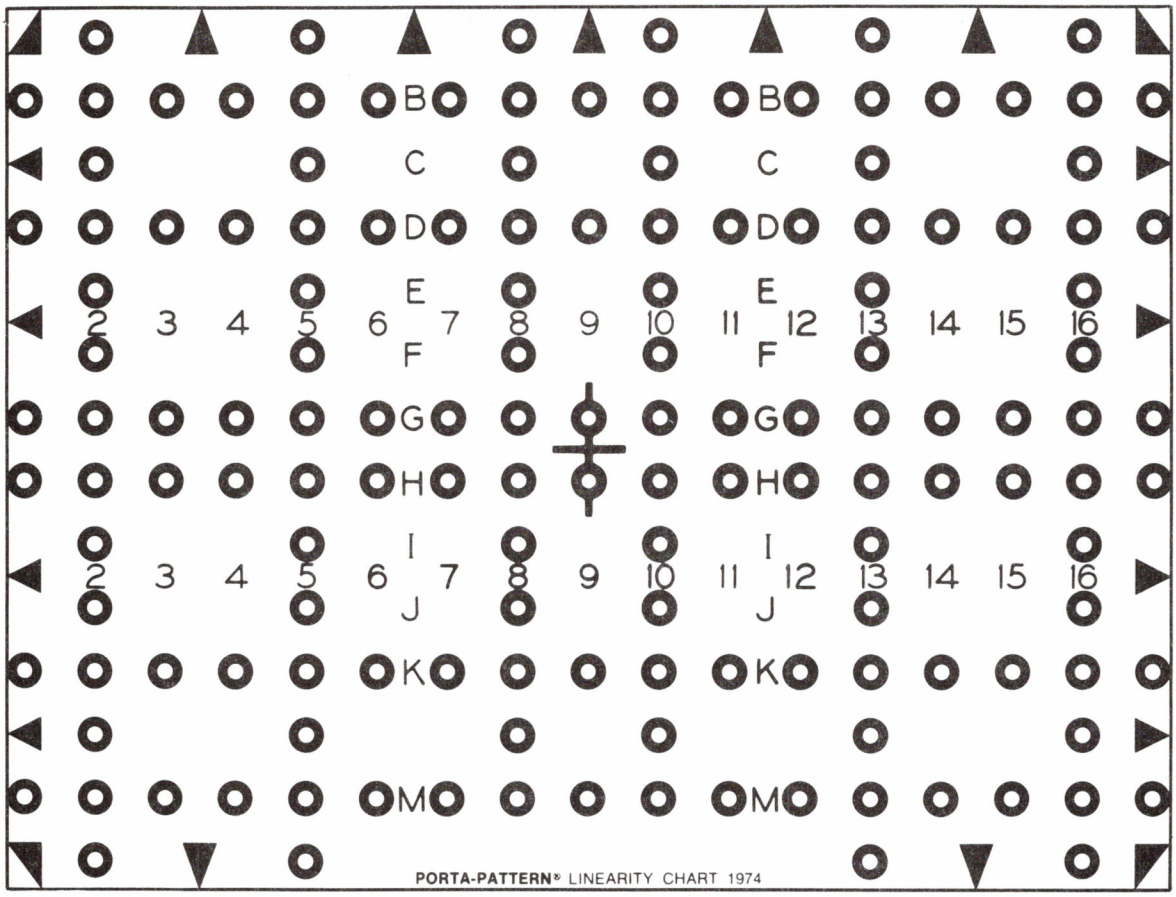


Figure 5-37. Crosshatch Pattern

STEP 3 Disconnect Tektronix 142 crosshatch generator. Retain connection between MONI output connector and B/W or color monitor and waveform monitor.

5-55 REGISTRATION ADJUSTMENT

Registration is affected by the highlight of the incoming signal. Set REGI/ENCR switch to ENCR. Put lens iris in the manual mode and shoot the registration chart fully framed in the raster. Adjust the lens iris for 70 IRE on waveform monitor during the registration adjustment.

Set controls as follows:

Controls	Position	Location
REGI/ENGR switch	REGI	Setup panel
R/OFF/B switch	R	Setup panel

(Continued next page)

Controls	Position	Location
G/OFF/-G switch	-G	Setup panel
RH CENT control	Center	Setup panel
RV CENT control	Center	Setup panel
BH CENT control	Center	Setup panel
BV CENT Control	Center	Setup panel

Adjust:

R Rotation	B Rotation
R51 (R H CENT)	R50 (B H CENT)
R100 (R V CENT)	R99 (B V CENT)
L5 (R WID)	L6 (B WID)
R62 (R H LIN)	R56 (B H LIN)
R161 (R HEIGHT)	R158 (B HEIGHT)
R152 (R V LIN)	R150 (B V LIN)
R186 (R T/B TRAP)	R189 (B T/B TRAP)
R187 (R T/B PIN)	R190 (B T/B PIN)
R142 (R L/R TRAP)	R146 (B L/R TRAP)
R143 (R L/R PIN)	R147 (B L/R PIN)
R172 (R SKEW)	R173 (B SKEW)

All controls are located on Deflection HV PWA

Observe: B/W Monitor

5-56 Overall Registration

STEP 1 Replace EIA linearity chart with EIA registration chart fully framed in raster.

STEP 2 Adjust R rotation screw so that red and green lines coincide over entire raster. After this adjustment, lock red coil assembly by using the locking screw. Make sure rotation and back-focus are not upset. Adjust R51 (R H CENT), R100 (R V CENT), L5 (R WID), R62 (R H LIN), R161 (R HEIGHT), R152 (R V LIN), and R172 (R SKEW) for picture coincidence over entire raster.

STEP 3 For blue and green registration, set R/OFF/B switch to B. Adjust B rotation screw and lock it in position. Adjust R50 (B H CENT), R99 (B V CENT), L6 (B WID), R56 (B H LIN), R158 (B HEIGHT), R150 (B V LIN), and R173 (B SKEW) for picture coincidence over entire raster.

Note

The locking screw, once locked, sometimes upsets mechanical back-focus. Therefore check back-focus again and if necessary adjust in accordance with the procedure of paragraph 5-46.

5-57 Corner Registration

It is advisable to initially set corner registration potentiometers to their mechanical centers. See Figure 5-38.

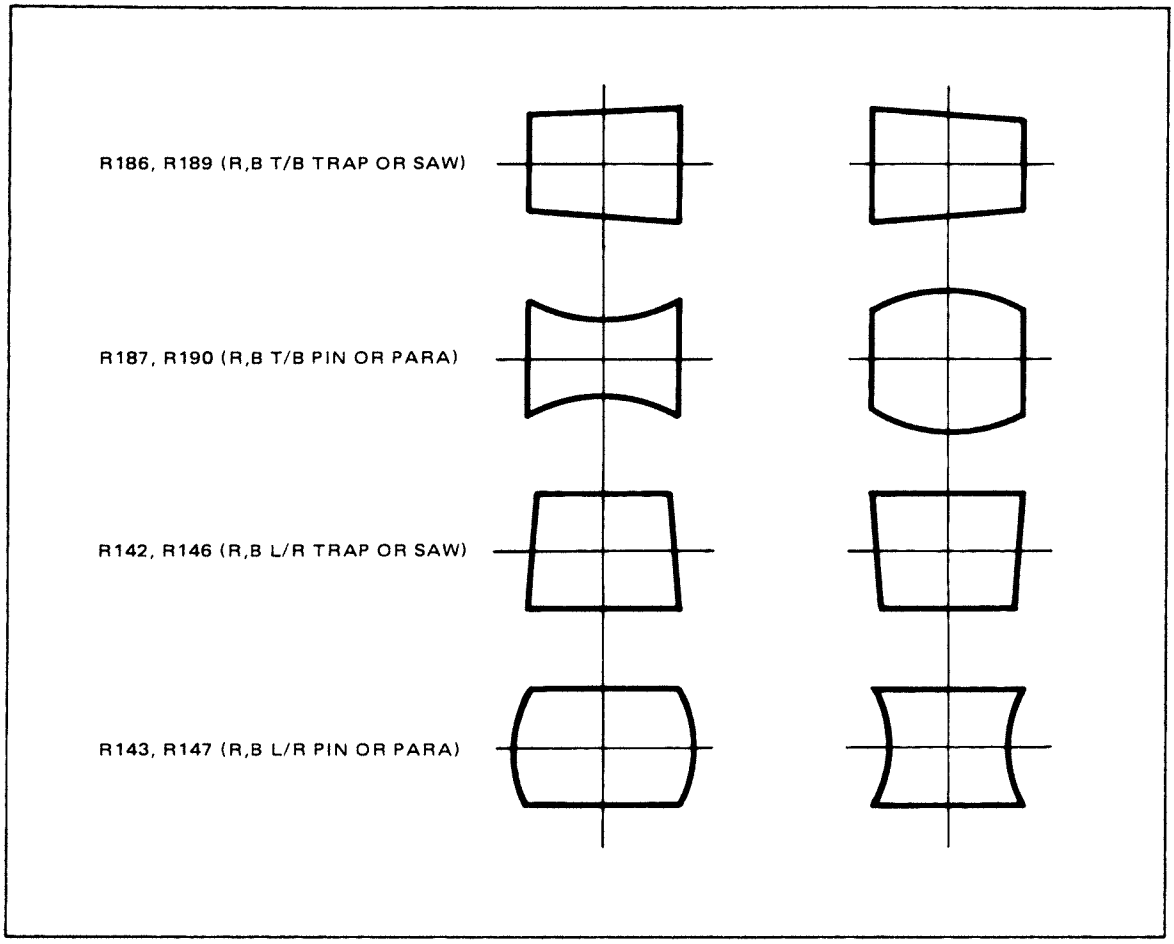


Figure 5-38. Corner Registration Controls

STEP 1 Set R/OFF/B switch to R.

STEP 2 TRAP (trapezoid) and PIN (pincushion) controls change the raster as shown in Figure 5-38. Adjust R186 (R T/B TRAP) and R187 (R T/B PIN), R142 (R L/R TRAP) and R143 (R L/R PIN) until the amount of corner distortion is reduced. If necessary, readjust overall registration according to paragraph 5-56.

STEP 3 Switch R/OFF/B switch to B and adjust blue corner registration in same way, using following potentiometers:

R189 (B T/B TRAP)	R146 (B L/R TRAP)
R190 (B T/B PIN)	R147 (B L/R PIN)

5-58 PROCESS ADJUSTMENT USING INCOMING LIGHT SIGNAL

Set controls as follows:

Controls	Position	Location
Optical Filter	O closed (Saticon)	Left side of No. 4 closed camera (Plumbicon)
CAM + VTR/CAM/OFF switch	CAM	
OPR/ST BY switch	OPR	
EXT/BATT switch	EXT	
0dB/+9dB/+18dB switch	+18 dB	
REGI/ENCR switch	ENCR	Setup panel

5-59 Dark Shading Adjustment

Test Point: TP203, TP303, TP403 Process PWA

Adjust:

R2 (R H SAW)	R10 (R H PARA)
R4 (G H SAW)	R12 (G H PARA)
R6 (B H SAW)	R14 (B H PARA)
R17 (R H COR)	R23 (H COR1)
R19 (G H COR)	R1 (H COR2)
R26 (R V SAW)	R34 (R V PARA)
R28 (G V SAW)	R36 (G V PARA)
R30 (B V SAW)	R38 (B V PARA)
R41 (R V COR)	R47 (V COR1)
R43 (G V COR)	R25 (V COR2)
R45 (B V COR)	

All controls located on Process PWA.

STEP 1 Cap lens and set gain to +18 dB.

STEP 2 Observe encoded output on waveform monitor. Adjust M-PED on setup panel for 20-IRE output.

STEP 3 Connect scope to TP303 and adjust potentiometers listed below for flattest waveform. Use Process PWA pin 13 for H trigger and pin 15 for V trigger. See Figure 5-39.

Note

There are three potentiometers for green horizontal corner shading, R19 (G H COR), R23 (H COR1) and R1 (H COR2). G H COR determines the amount of corner signal introduced. H COR1 determines where the compensation is done. H COR2 determines the compensation balance between two sides. H COR1 and H COR2 are common for R, G and B channel compensation. For vertical corner shading there are similar controls.

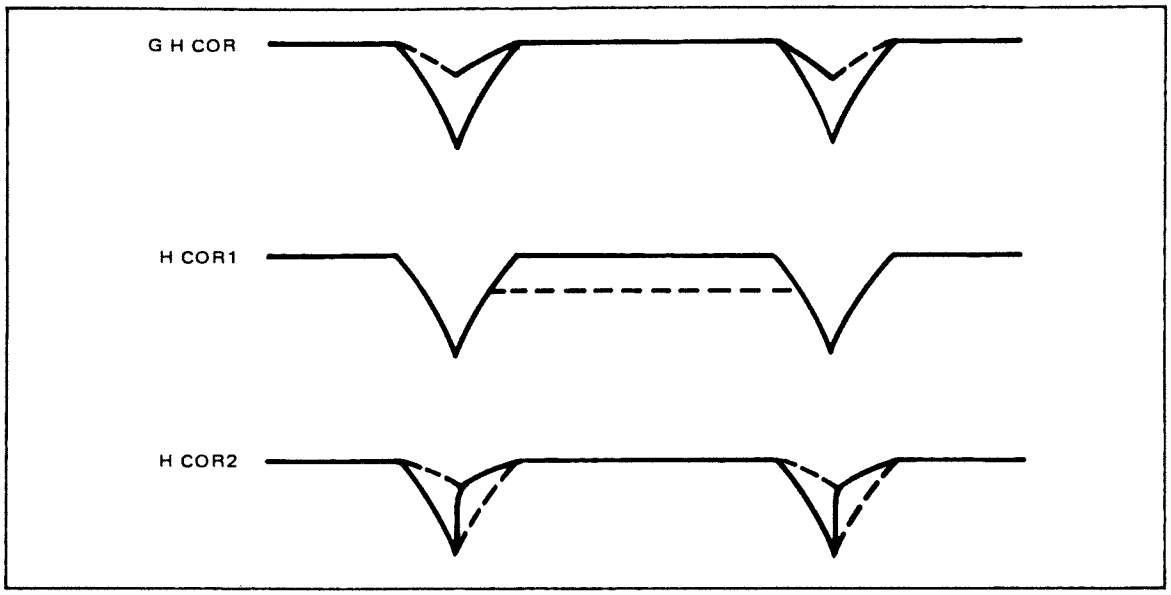


Figure 5-39. Dark Shading Adjustment Waveforms

STEP 4 Repeat step 3 for red and blue channel using TP203 and TP403 and adjusting the following controls:

R2 (R H SAW)	R10 (R H PARA)
R17 (G H COR)	
R26 (R V SAW)	R34 (R V PARA)
R41 (R V COR)	
R6 (B H SAW)	R14 (B H PARA)
R21 (B H COR)	
R30 (B V SAW)	R38 (B V PARA)
R45 (B V COR)	

5-60 Pulse Cancel Adjustment

Adjust: R65, R67, R69 (R, G, B PULSE CANCEL) Process PWA

Observe: Oscilloscope and vectorscope.

STEP 1 Keep the lens closed. Keep the pedestal level at 20 IRE using M-PED on setup panel.

STEP 2 Observe signal at TP302 using an oscilloscope and adjust potentiometer R67 (G PULSE CANCEL) so that the level remains the same through 0/+9/+18-dB positions of gain select switch. Use pin 13 of SYNC GEN J1 connector for scope trigger.

STEP 3 Observe vectorscope noise dot through 0/+9/+18-dB positions on gain select switch and adjust potentiometers R65, R69 (R, B PULSE CANCEL) so that dot does not change position in any direction. If dot is not in the center, adjust R and B pedestals to center it for easier viewing.

STEP 4 Reduce output to normal 7.5 IRE using M-PED control on setup panel.

5-61 GAIN 1 ADJUSTMENT

Adjust: R211, R311, R411 on Process PWA

Observe: Waveform monitor

STEP 1 Set the AUTO/PRE SET switch to PRE SET.

STEP 2 Change filter wheel position to 1 (Saticon) or to 1 and A (Plumbicon).

STEP 3 Shoot EIA gray scale chart fully framed under normal illumination. Note that 200fC (2150 Lux) f/3.5 (Saticon) is normal and f/4 (Plumbicon) is normal.

STEP 4 Set iris opening exactly by connecting scope probe to TP301 and adjusting iris opening until 0.26 Vp-p is obtained. Leave setting at this point for G as well as R and B adjustments. See Figure 5-40.

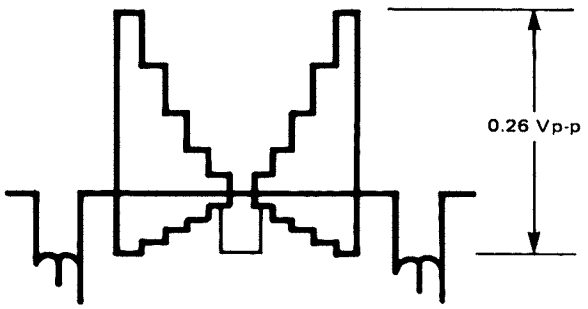


Figure 5-40. Gain 1 Adjustment, TP 301

STEP 5 Set the gain select switch to 0 dB.

STEP 6 Connect the scope probe to TP302 and adjust potentiometer R311 (G GAIN 1) for 0.5-Vp-p signal; this is GAIN 1 adjustment for G channel.

STEP 7 Observe encoded output on waveform monitor. Adjust potentiometers R211, and R411 (R, B GAIN 1) for minimum carrier leak at top portion of gray scale. See Figure 5-41.

5-62 Smear Adjustment

Test Point: TP401, TP201, TP301 on Process PWA

Adjust: C5 on Pre Amp PWA

STEP 1 Shoot the megacycle test chart fully framed in the raster. Adjust the iris lens for 70 IRE at MONI OUT.

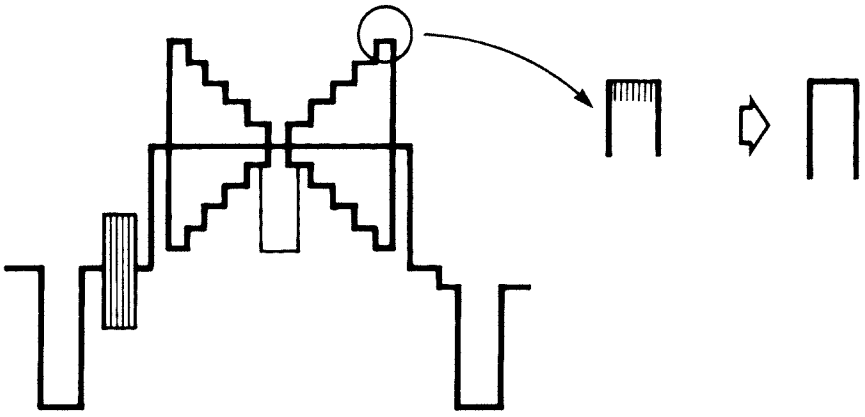


Figure 5-41. Adjusting for Minimum Carrier Leak

STEP 2 Observe TP301 on the Process PWA using an oscilloscope. Turn C5 on Pre Amp PWA to obtain the cleanest waveform as shown in Figure 5-42.

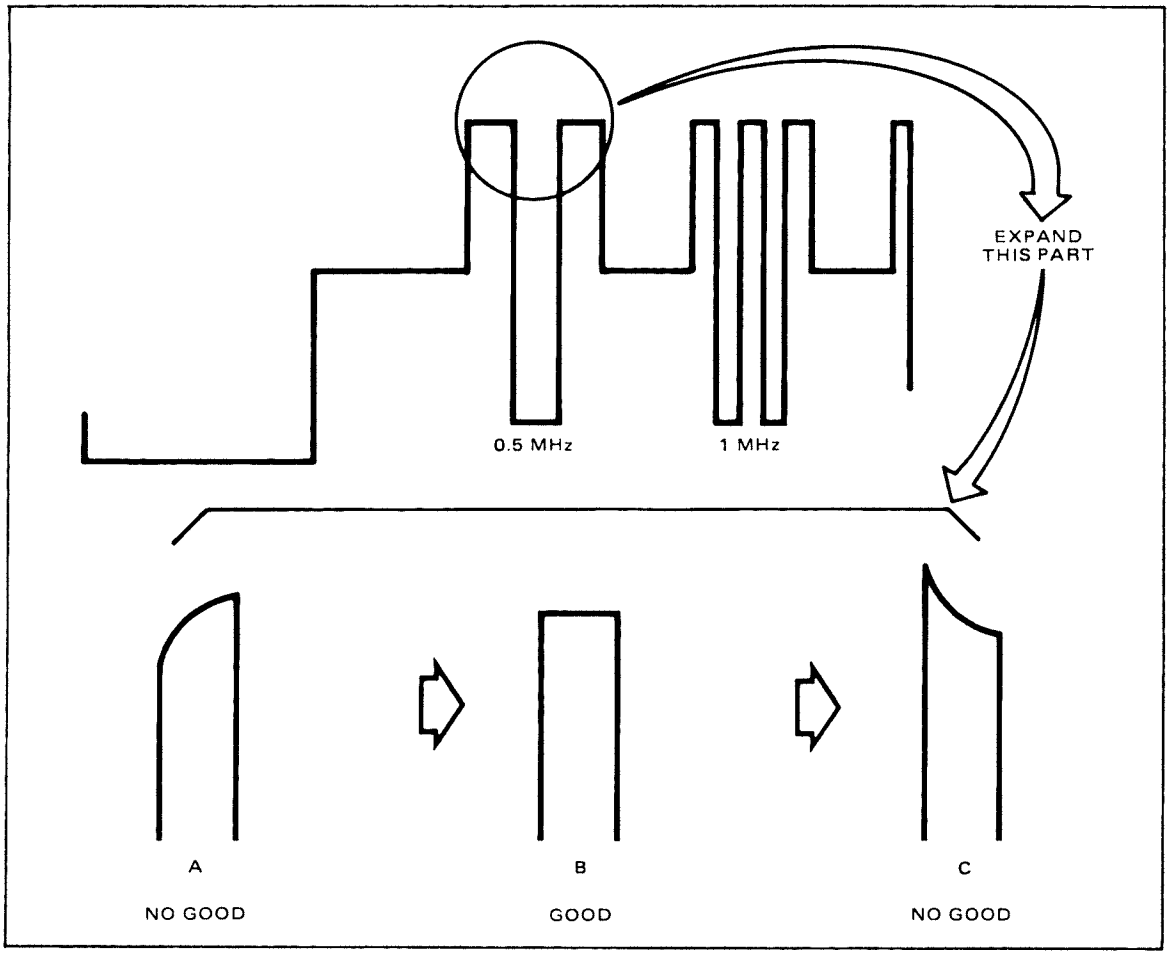


Figure 5-42. Smear Adjustment, TP 301

STEP 3 Repeat the same procedure for red and blue channels using TP201 and TP401 respectively.

Alternate procedure:

Instead of megacycle chart use a window chart and adjust C5 for best pulse response, i.e., no overshoot and no smeared edges. Location of G channel C5 access hole is above REGI control on setup panel.

5-63 Pregamma Adjustment

Adjust: R242, R342, R442 (R, G, B PRE GAMMA ADJ) on Process PWA

Observe: Waveform monitor

STEP 1 Change the chart to EIA gray scale.

STEP 2 Keep the normal lighting f/stop conditions and shoot the gray scale chart (f/3.5 for Saticon, f/4 for Plumbicon). This should correspond to about 100 IRE.

STEP 3 Observe encoded output at MONI OUT on the waveform monitor. Adjust R242, R442 (R, B PRE GAMMA ADJ) for minimum carrier leak in middle portion of gray scale (see Figure 5-43).

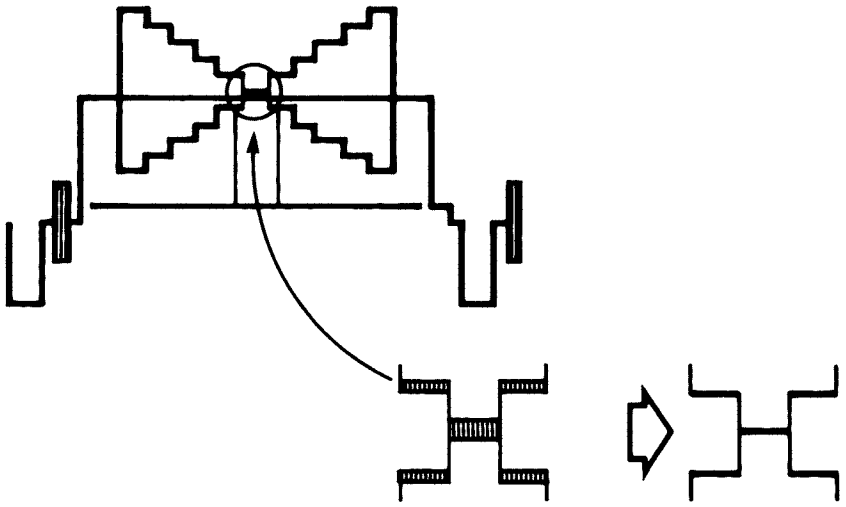


Figure 5-43. Minimum Carrier Leak Adjustment

STEP 4 For more accurate results, R342 (G PRE GAMMA) reference may require slight resetting. After resetting eliminate carrier leak again by adjusting R242 and R442 as before.

5-64 Flare Adjustment

Note

Flare appears as color misbalance in the dark picture portions when the scene is predominately white. The picture usually tends to become too red.

Adjust: R248, R348, R448 (R, G, B FLARE) on Process PWA

Observe: Waveform monitor

STEP 1 Shoot a scene which includes a white card with small patch of perfect black. Observe portion of the signal corresponding to black on waveform monitor. Use light box with no slides for predominant white portion and use black tape or any convenient material to block off a small portion of light box surface.

STEP 2 Frame image to best observe black portion on waveform monitor. If any carrier is observed under these conditions, adjust R248, R348, R448 (R, G, B FLARE). B FLARE will seldom need adjustment. R FLARE will require most adjustment.

5-65 Modulation Shading

Adjust: R96, R97 (R, B MOD SHAD) on Process PWA

Observe: Waveform monitor and/or vectorscope

STEP 1 Aim camera at registration chart so that chart just fills screen.

STEP 2 Observe signal on waveform monitor at V-rate and adjust iris so that video level is 100 IRE.

STEP 3 Adjust R96, R97 (R, B MOD SHAD) on PROCESS PWA so that subcarrier component of white level signal is minimum. Alternately adjust R96 and R97 for minimum dot on vectorscope.

5-66 AUTO BLACK/WHITE BALANCE ADJUSTMENT

Set controls as follows:

Controls	Position	Location
IRIS AUTO/REM/MANU	AUTO	Lens switch
ABBC switch	ON	Process PWA
W BAL AUTO/PRE SET switch	AUTO	Left side of camera
0dB/+9dB/+18dB switch	0dB	Left side of camera

(Continued next page)

Controls	Position	Location
Optical Filter	1 (Saticon) 1 A (Plumbicon)	On the optics
REGI/ENCR switch	ENCR	Setup panel

5-67 Auto Black Balance Adjustment

Adjust: R136, R141 (R, B ABBC) on Process PWA

Observe: Waveform monitor

STEP 1 Set auto WHITE/BLACK switch on camera front panel to BLACK and hold down during entire adjustment of black balance.

STEP 2 Adjust R136 (R ABBC), R141 (B ABBC) until pedestal carrier leak of NTSC signal is minimized on waveform monitor. This minimum carrier peak is normally less than 2 IRE. Confirm that WARNING lamp in viewfinder lights during AUTO black balance process and is off when switch is released.

5-68 Auto White Balance Adjustment

Adjust: R129, R141 (R, B AWBC) on Process PWA
Observe: Waveform Monitor

Note

This adjustment must be done after auto BLACK adjustment is completed.

STEP 1 Shoot EIA gray scale or registration chart under normal illumination and frame it fully in the raster.

STEP 2 Set auto WHITE/BLACK switch to WHITE and hold up during this adjustment.

STEP 3 Adjust R129 (R AWBC), R134 (B AWBC) until carrier leak of NTSC signal is minimized. Confirm that WARNING lamp in viewfinder lights during AUTO white balance process and is off when switch is released.

Note

For normal use R109 (GATE) should be set fully cw.

5-69 APERTURE CORRECTION ADJUSTMENT

Set controls as follows:

Controls	Position	Location
IRIS AUTO/REM/MANU	MANU	Lens switch

(Continued next page)

Controls	Position	Location
REGI/ENCR switch	ENCR	Setup panel
DTL ON/OFF switch	ON	Setup panel
0dB/+9dB/+18dB switch	0dB	Left side of camera
R75 (LEVEL DPNT)	Fully ccw	Two-Line VAC PWA
R25 (DTL)	Fully cw	Encoder 1 PWA
R23 (NOISE SLICE)	Fully ccw	Encoder 1 PWA
R8 (WH CLIP)	Fully cw	Encoder 2 PWA
R11 (BLK CLIP)	Fully ccw	Encoder 2 PWA

Adjust: R11 (WH CLIP), R8 (BLK CLIP) on Encoder 2 PWA

Observe: Waveform monitor

STEP 1 Set CAM+VTR/CAM/OFF to OFF. Remove Encoder 2 PWA from motherboard and insert extender. Connect Encoder 2 PWA on end of extender. Set CAM+VTR/CAM/OFF to CAM position again.

STEP 2 Shoot gray scale chart under normal illumination. Observe encoded output and adjust lens focus for best focus. Also adjust lens iris so that DTL signal at white portion is over 117 IRE.

STEP 3 Adjust potentiometer R11 (WH CLIP) so that signal is cut at 117 IRE. Adjust potentiometer R8 (BLK CLIP) so that faint signal under 0-IRE point is cut at this point.

5-70 INDICATOR LEVEL ADJUSTMENT

Set controls as follows:

Controls	Position	Location
REGI/ENCR switch	ENCR	Setup panel
IND ON/OFF	ON	VF (center switch)
IRIS AUTO/REM/MANU switch	MANU	On lens

Adjust: R6 (IND LEVEL) on Monitor PWA

Observe: 1.5-in. VF

STEP 1 Observe NTSC signal through MONI OUT using waveform monitor.

STEP 2 Point camera at gray scale chart and adjust lens iris for 105-IRE white level.

STEP 3 While observing 1.5-in VF, adjust R6 (IND LEVEL) until stripe pattern appears on the portion where the video level is over 100 IRE (highlight white clip).

STEP 4 After adjusting R6 which is located on the MONI board, reduce iris to obtain 100-IRE signal level. At this time the stripe pattern should disappear.

5-71 LENS LEVEL AND RESPONSE ADJUSTMENT

Set controls as follows:

Controls	Position	Location
REGI/ENCR switch	ENCR	Setup panel
REM/AUTO/MAN switch	AUTO	On lens

Adjust: VIDEO LEVEL, IRIS GAIN

Observe: Waveform monitor

STEP 1 Shoot gray scale chart under normal illumination. Set video level adjustment knob on front of lens to center position. Observe encoded signal through MONI OUT on waveform monitor.

STEP 2 Remove rubber dust cap from video level adjustment screw access hole on front of lens. Use a screwdriver to adjust this control for 100 IRE. When adjustment is complete, cap access hole.

STEP 3 Remove cap from iris gain adjustment access hole also on front of lens. Adjust this control for minimum hunting as lens is closed by hand (or cap) and quickly opened. After this adjustment, cap access hole.

5-72 1.5-IN. VIEWFINDER ADJUSTMENTS

5-73 Horizontal and Vertical Hold Adjustment

Adjust: R19 (V HOLD), R25 (H HOLD) 1.5-Inch Viewfinder 1 PWA

Observe: Viewfinder

STEP 1 Adjust R19 (V HOLD) for center position of H LOCK-IN area.

STEP 2 Adjust R25 (H HOLD) for center position of V LOCK-IN area.

5-74 Deflection Yoke Position Adjustment

Adjust: CRT coil assembly

Observe: Viewfinder

STEP 1 Set REGI/ENCR switch on setup board to NTSC position.

STEP 2 Point camera at registration chart and set IRIS AUTO/REM/MAN on zoom lens to AUTO position.

STEP 3 Confirm that camera is standing upright and level, and that optical axis of camera is perpendicular to chart.

STEP 4 Loosen deflection yoke setscrew. Observe the tilt, if any, in picture on viewfinder and turn deflection yoke until picture is straight (level). Tighten deflection yoke setscrew.

5-75 Centering Magnet Adjustment

Adjust: Centering magnet rings

Observe: Viewfinder

Adjust centering magnet rings on rear of the deflection yoke to center the picture (Figure 5-34).

5-76 Horizontal Size Adjustment

Adjust: L4 (WIDTH)—1.5-Inch Viewfinder 2 PWA

Observe: Viewfinder

STEP 1 Point camera at registration chart to scan just to the blanking edges.

STEP 2 Set REGI/OFF/NTSC switch on setup panel to the NTSC position.

STEP 3 Observe picture displayed on viewfinder and adjust coil L4 until the proper size is obtained (See Figure 5-35B).

5-77 Vertical Size and Linearity Adjustment

Adjust: R36 (HEIGHT), R37 (V. LIN)—1.5-Inch Viewfinder 2 PWA

Observe: Viewfinder

STEP 1 Point camera at registration chart.

STEP 2 Observe picture displayed on viewfinder and adjust potentiometer R37 until best linearity is obtained; adjust potentiometer R36 until proper size is obtained.

STEP 3 Repeat previous steps, since these adjustments will interact.

5-78 Focus Adjustment

Adjust: R67 (FOCUS)—1.5-Inch Viewfinder 2 PWA

Observe: Viewfinder

STEP 1 Point camera at resolution chart.

STEP 2 Set BRIGHT and CONTRAST controls so that a normal level signal has proper brightness and contrast in viewfinder.

STEP 3 Adjust R67 (FOCUS) for best focus.

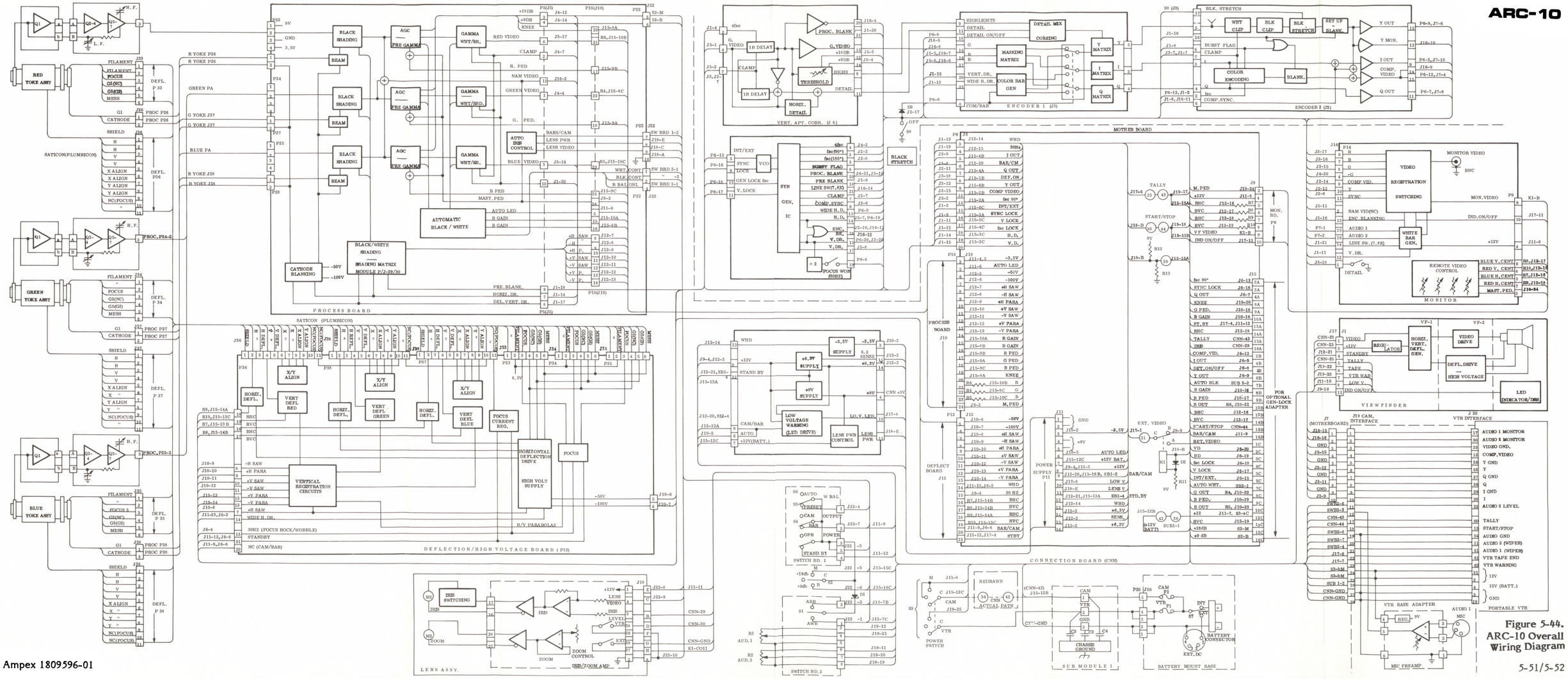


Figure 5-44. ARC-10 Overall Wiring Diagram

SECTION 6
GENLOCK ADAPTER

6-1 GENERAL

This section of the manual provides general information, installation instructions, operating instructions, and theory and maintenance information for the Genlock Adapter, Ampex Part No. 1418550 (NTSC) and No. 1418560 (PAL).

6-2 DESCRIPTION

The genlock adapter, shown in Figure 6-1, enables the Ampex FPC-10 color camera to operate independently and not in association with an M-format VTR. Some of the important features and capabilities of the adapter are listed below.

- Permits quick conversion of the FPC-10 camera between the M-format standard and the NTSC or PAL standard. This enables the camera to work with any VTR.
- The camera can be genlocked to composite video or black burst.
- Camera can be remotely controlled in a studio environment.

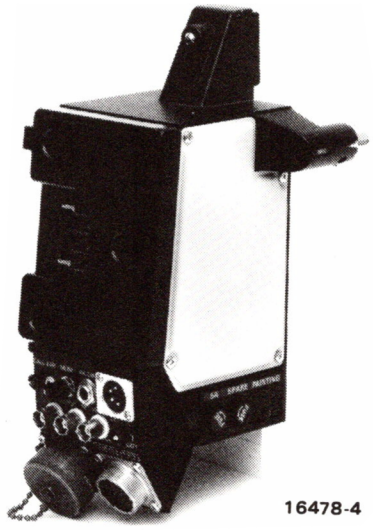


Figure 6-1. Genlock Adapter Used With FPC-10 Camera

6-3 SPECIFICATIONS

Specifications for the genlock adapter are listed in Table 6-1. All specifications are subject to change without notice or obligation.

Table 6-1. Genlock Adapter Specifications

Item	Specifications	Connector
Power Requirement	9V, 0.1A, 0.9W	
Input Signals		
External sync for genlock	VBS 1 Vp-p, 75Ω	BNC
Microphone input	-70 dBm or -20 dBm switchable, balanced	XLR
Return video/playback video	1 Vp-p, 75Ω	REMO VTR
Intercom/program audio from RCU	0 dB	REMO
Playback audio	-20 dB	VTR
Tally	+9 Vdc, 1 kΩ	REMO
Commands from RCU	Multiplexed on a single-wire bar/cam, OPP/ST, +9 dB, +18 dB, DTL ON/OFF, auto white, auto black	REMO
Centering	R-H, B-H, R-V, B-V	REMO
Gain	R-gain, B-gain	REMO
Pedestal	R-ped, B-ped, M-ped	REMO
Iris	Iris	REMO
Genlock	SC phase, H phase, V reset	REMO
Warning indicators	VTR warning, VTR tape end	VTR
Output Signals (Remote)		
Composite video	1 Vp-p, 75Ω	REMO, VTR, BNC
R, G, B, or Y, I, Q video	Video/sync 0.714 Vp-p	REMO
Microphone output	-20 dBm or -70 dBm balanced	REMO VTR

(Continued next page)

Table 6-1. Genlock Adapter Specifications (Continued)

Item	Specifications	Connector
Output Signals (Remote) (Continued)		
Return video/playback video	VBS 1 Vp-p, 75Ω	BNC
Intercom/program audio from RCU	0 dB	REMO VTR
Playback audio	-20 dB	
MIC monitor		Inter-com Ear-phone
Tally	+9 Vdc	Gen-lock-in
Commands from RCU	Multiplexed on a single-wire cable, OPP/ST, +9 dB, +18 dB, DTL ON/OFF, auto white, black	REMO
Centering	R-H, B-H, R-V, B-V	REMO
Gain	R-gain, B-gain	REMO
Pedestal	R-ped, B-ped, M-ped	REMO
Iris	Iris	REMO
Genlock	SC phase, H-phase, V-reset	REMO
Warning indicators	VTR warning, tape end	VTR
Indicators		
Genlock	LED	
Tally	LED	
External Controls		
Call	+9 Vdc, 1Ω	
Dc input selector	Cable dc-in connector/battery	
Audio monitor level	Volume control	
Painting	R-gain, B-gain controls	

(Continued next page)

Table 6-1. Genlock Adapter Specifications (Continued)

Item	Specifications	Connector
Controls Inside Cover		
MIC gain	Volume control	
Playback monitor	Volume control	
Sidetone	Volume control	
Tally	ON/OFF switch	
VTR trigger	± switch	
SC	0°/90°/180°/270° switch 0°—90° variable	
H phase	+3 µs—1 µs variable	
Operating Conditions		
Temperature	-4°F to 122°F (-20°C to 50°C)	
Humidity	Less that 90%	
Dimensions (H x W x D)	250 mm x 120 mm x 120 mm	
Weight	2.13 lb (0.97 kg)	

6-4 INSTALLATION

The following paragraphs provide instructions for mounting the genlock adapter on the FPC-10 camera and system interconnection information.

6-5 Mounting Instructions

Use these procedures to mount the genlock adapter onto the FPC-10 camera.

STEP 1 If attached, remove FPR-10 portable VTR from FPC-10 camera as follows (see Figure 6-2):

a. Loosen camera/VTR anchor knob and pull knob outward.

b. Remove VTR from camera by rotating then lifting VTR wedge from mounting wedge of camera.

STEP 2 See Figure 6-3. Remove battery mounting base from battery bracket by loosening four captive screws. Disconnect battery connector to completely free mounting base from bracket.

STEP 3 The genlock adapter is attached to camera in same manner as the VTR. See Figure 6-4. Align mounting wedges of genlock adapter and camera

and rotate genlock adapter downward into place on camera base. Secure adapter with anchor knob loosened and pulled outward as in step 1.

STEP 4 See Figure 6-5. Secure trim cover to camera frame with two screws.

STEP 5 To use a cableless microphone, remove existing microphone holder from FPC-10 camera and install new microphone holder onto camera head as shown in Figure 6-6.

STEP 6 To power genlock adapter/camera with battery power pack, attach battery to mounting bracket shown in Figure 6-5.

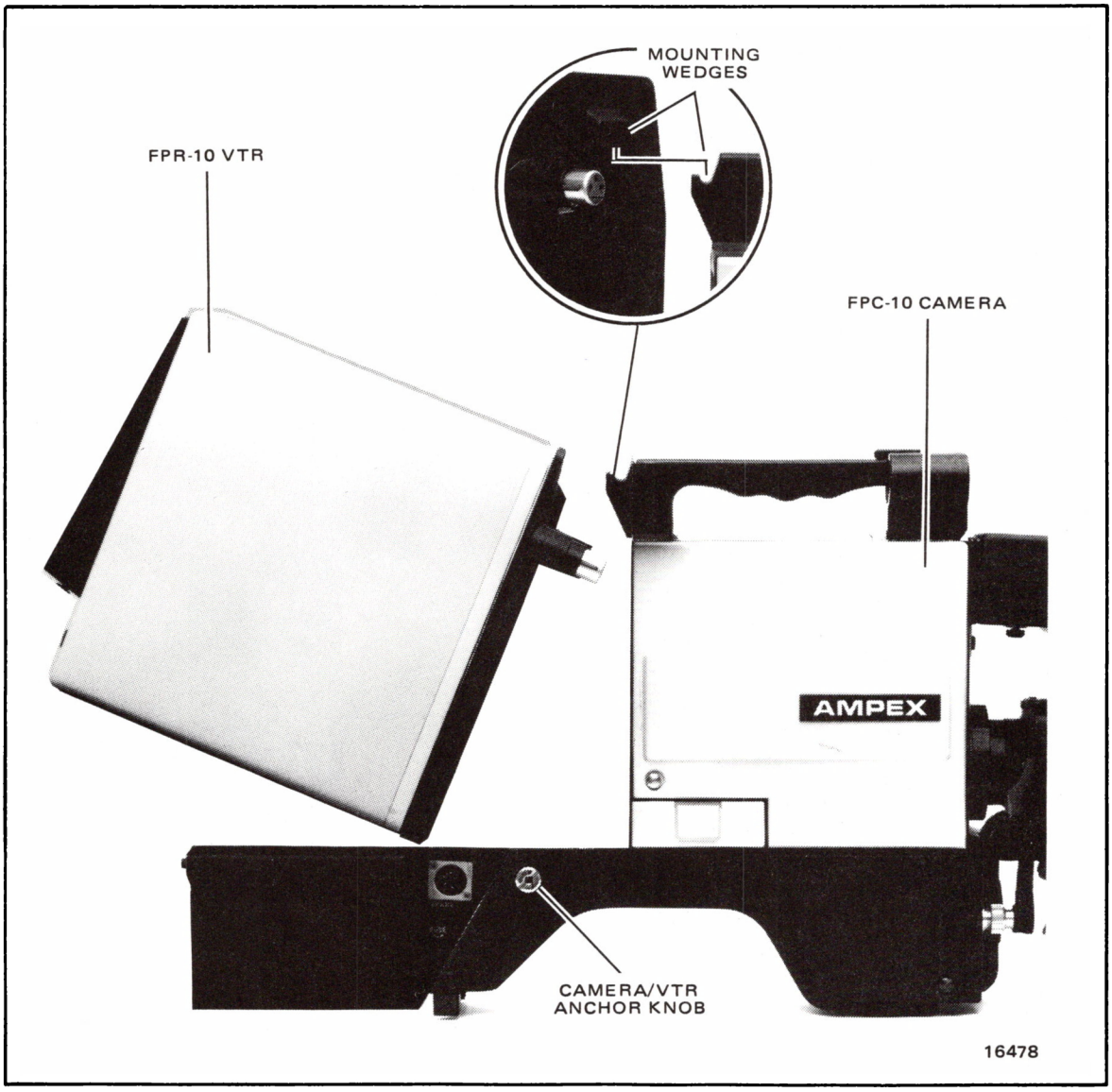


Figure 6-2. Removing FPR-10 Portable VTR from FPC-10 Camera

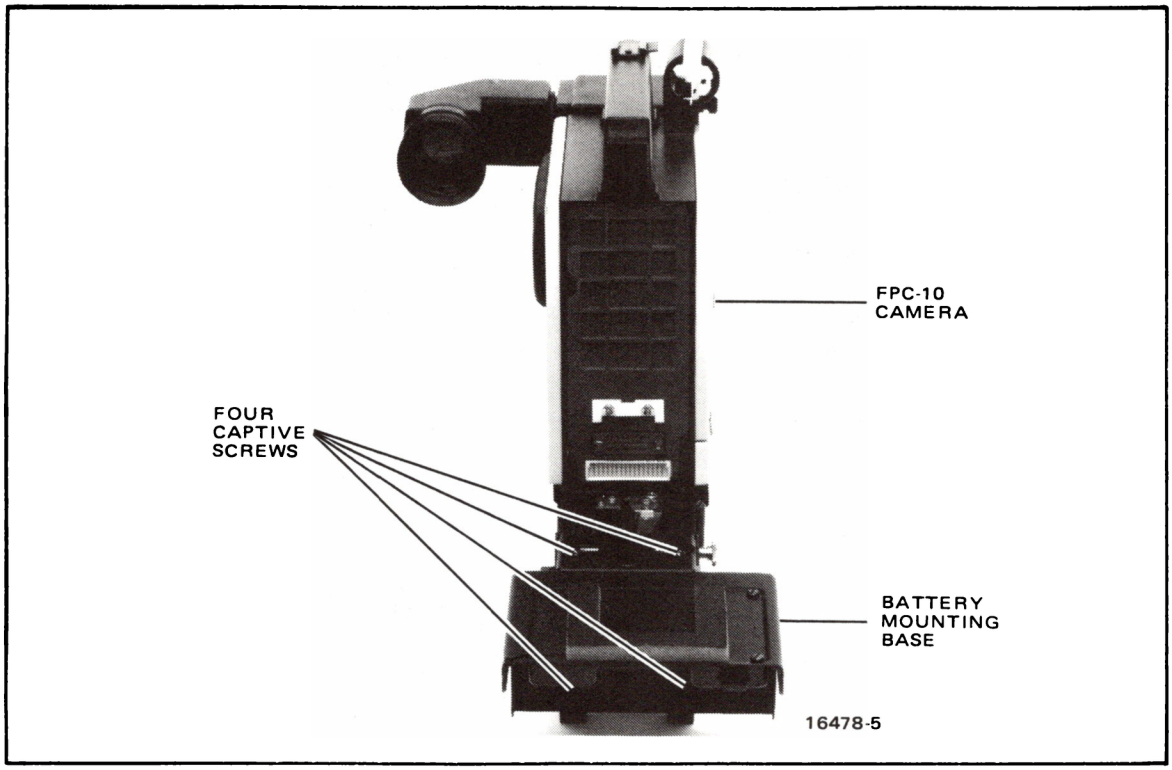


Figure 6-3. Removing Battery Mounting Base from FPC-10 Camera

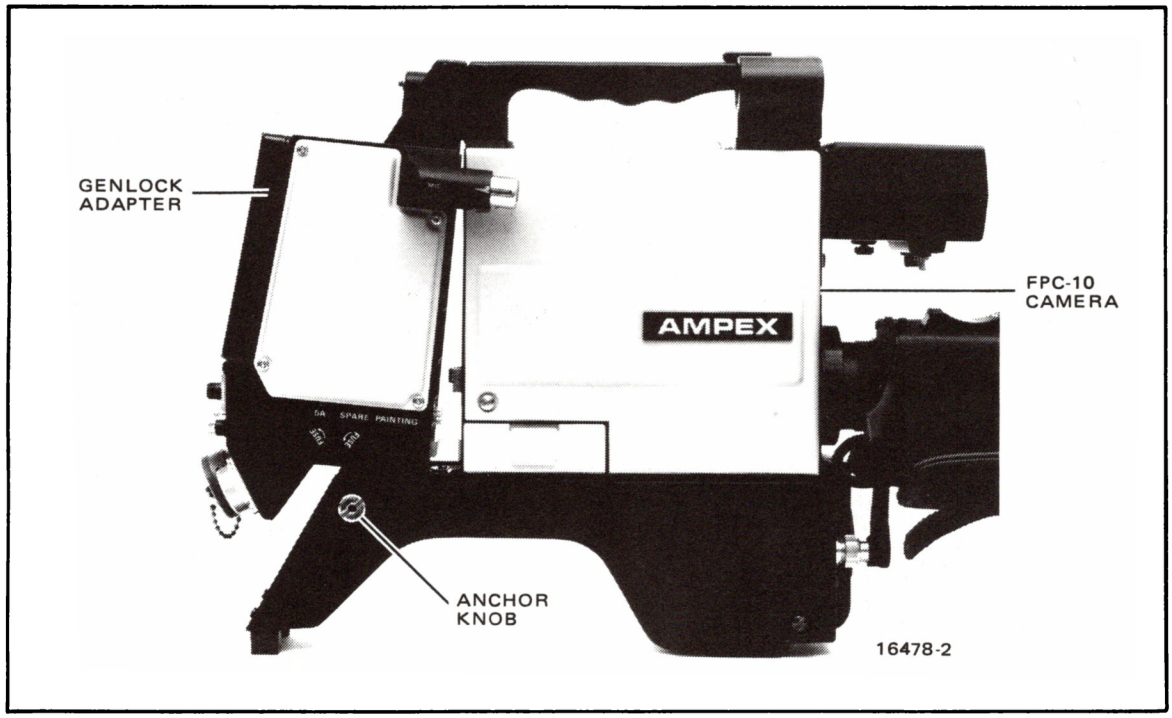


Figure 6-4. Attaching Genlock Adapter to FPC-10 Camera

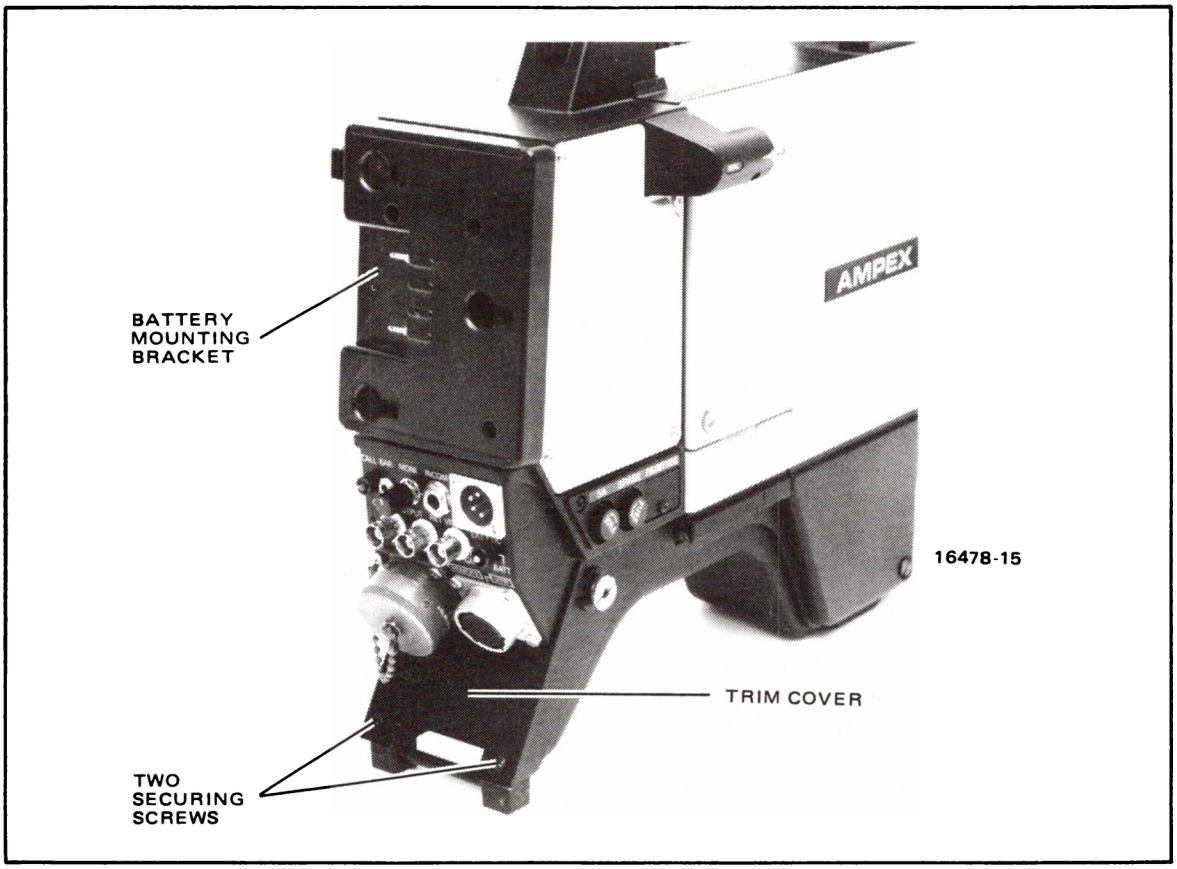


Figure 6-5. Attaching Trim Panel to FPC-10 Camera Frame

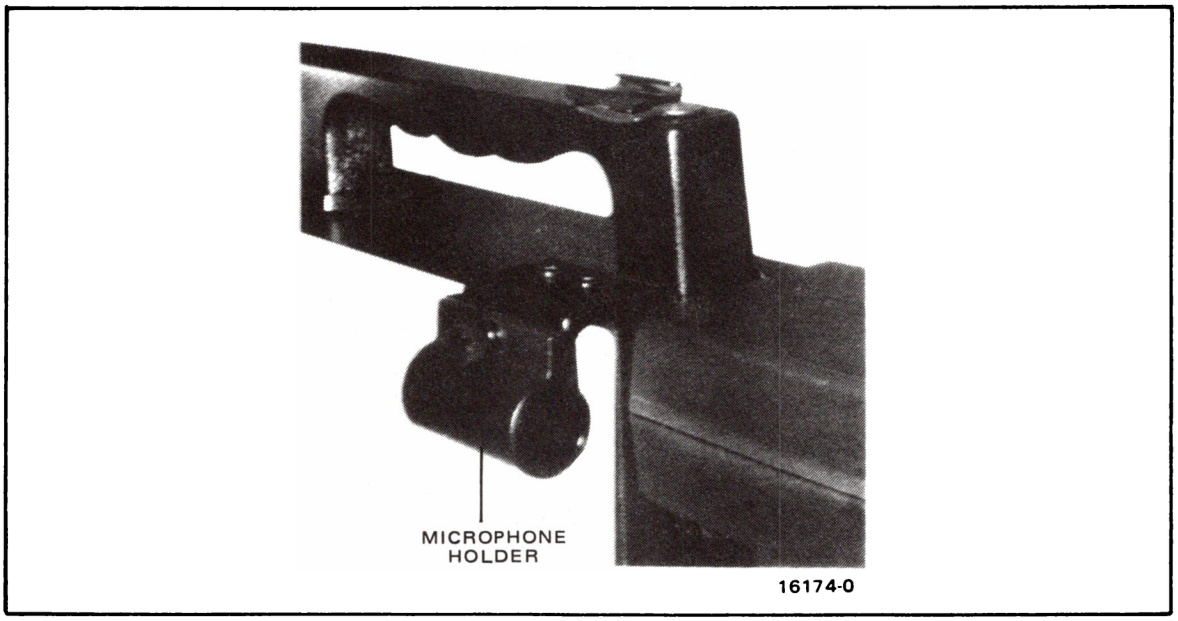
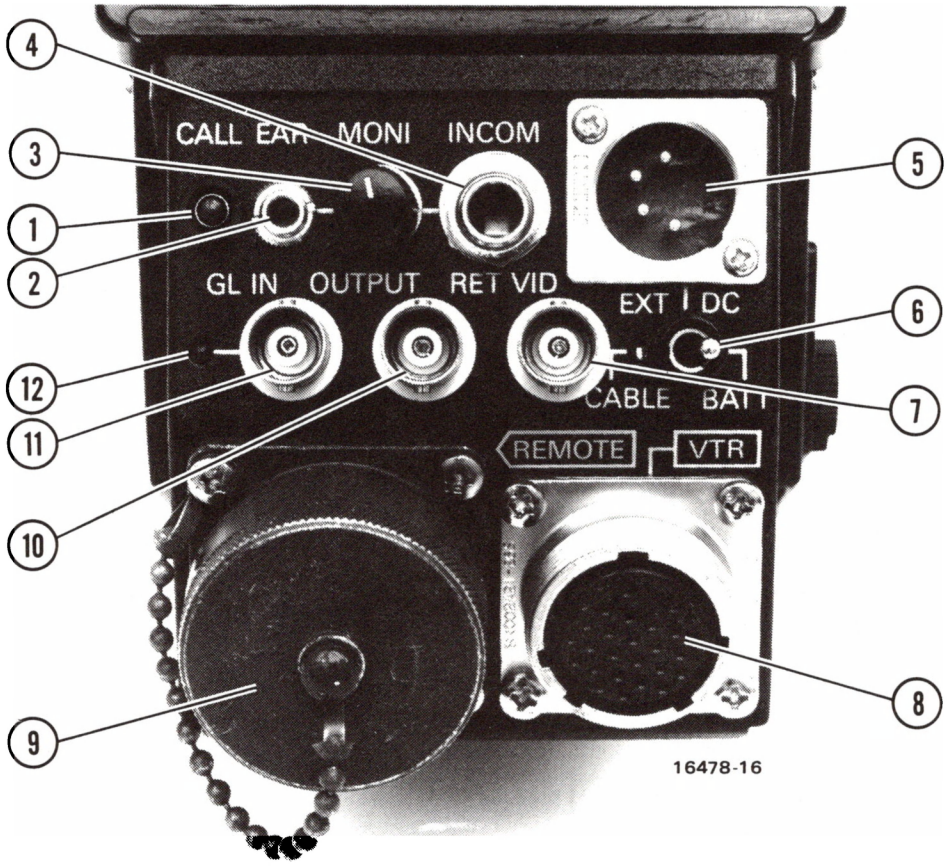


Figure 6-6. Microphone Holder

6-6 Power, Signal, and Control Connections

Camera/genlock adapter interface connections are all made to the connector panel at the rear of the genlock adapter. A description of the interface switches and connectors is given in Table 6-2.

Table 6-2. Rear Connector Panel Switches, Connectors, and Controls



Index No.	Desig-nation	Name	Description
1	S101	CALL	Call switch. When pressed camera and RCU tally lights illuminate.
2	J123	EAR	Earphone jack. Can be used to: • Monitor microphone audio input level. • Monitor playback audio level. • Monitor intercom or program audio from RCU.

(Continued next page)

Table 6-2. Rear Connector Panel Switches, Connectors, and Controls (Continued)

Index No.	Desig-nation	Name	Description
3	R111	MONI	Potentiometer control. Used to adjust earphone and intercom level.
4	J122	INCOM	Intercom jack
5	J114	EXT DC	External dc input XLR 4-pin connector. When power is furnished to connector, set CABLE/EXT DC/BATT switch (index 6) to EXT.
6	S102	CABLE/ EXT DC/ BATT	Power input three-postion toggle switch: BATT position: Used when Anton Bauer battery attached to battery mounting bracket supplies power. EXT DC position: Used when external dc is furnished to external dc input XLR 4-pin connector (index 5). CABLE position: Used when power is supplied through REMOTE connector (index 9).
7	J118	RET VID	Return video BNC connector. Used to feed return video from RCU to color monitor.
8	J113	VTR	VTR 26-pin connector. Used to interface with external VTR.
9	J112	REMOTE	Remote control unit interface connector, Bendix No. PTO2A-20-41.
10	J116	OUTPUT	Output BNC connector. Used for composite video output when neither REMOTE or VTR cables are connected.
11	J117	GL IN	Genlock input BNC connector. Used to accept either standard NTSC or black burst as genlock reference signal.
12	--	Genlock	LED lights when genlock adapter is genlocked to indicator reference signal

6-7 VTR Interface Instructions

Use one of the following procedures to connect the FPC-10/genlock adapter to an associated VTR.

6-8 FPR-10 Videotape Recorder With FPR-S10 Video Adapter

Proceed as follows:

STEP 1 Use VTR 10-ft interface cable 26R-10 (Ampex Part No. 1418090) or 15-ft cable 26R-15 (Ampex Part No. 1418091).

STEP 2 See Figure 6-7. On genlock adapter set VTR start/stop trigger pulse switch to "-" front position.

STEP 3 See Figure 6-7. On genlock adapter set tally switch to front (FPR-10) position.

STEP 4 Set microphone level by adjusting CH1 on front of camera. Level is displayed on NTSC adapter meter.

CAUTION

WHEN USING A HIGH OUTPUT MICROPHONE OR OPERATING IN A NOISY ENVIRONMENT, ADJUST MICROPHONE AMPLIFIER VOLUME AND CH1 TO AVOID DISTORTION.

STEP 5 Set CAMERA switch on NTSC adapter to YIQ position.

Note

It is recommended that either the camera or VTR battery be used as a power source while the other battery is held in reserve.

6-9 CR4700 (Victor) or BVU110 (Sony) Videotape Recorders

Proceed as follows:

STEP 1 Use VTR 10-ft (3m) interface cable 14R-10 (Ampex Part No. 1418096) or 15-ft (4.5m) cable 14R-15 (Ampex Part No. 1418097).

STEP 2 See Figure 6-7. On genlock adapter set VTR start/stop trigger pulse switch to "+" (rear) postion.

STEP 3 See Figure 6-7. On genlock adapter, set tally switch to rear (on) position.

STEP 4 Audio input level for CR4700 is -20 dBm, and for BVU110 audio level is -60 dBm. When connecting to the BVU110, set CH 1 on the camera to a very low setting. Level is displayed on NTSC adapter meter.

STEP 5 In VTR playback mode, pressing RET on camera causes playback video to be seen on viewfinder and recorded audio to be heard on earphone.

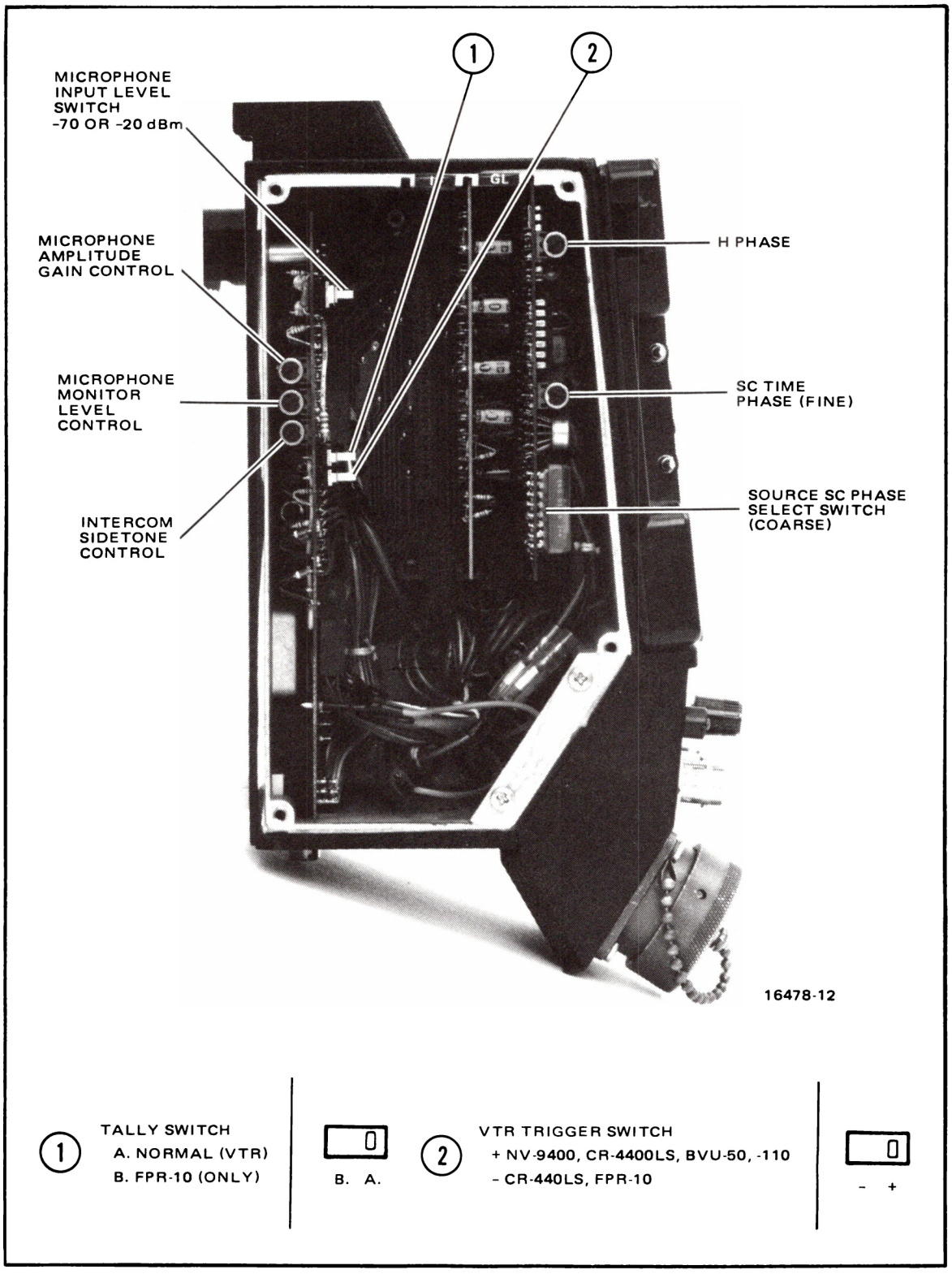


Figure 6-7. Adjustment Controls, Left Cover Panel Removed

6-10 NV9400 Panasonic or CR4400 Victor Series Videotape Recorders

Proceed as follows:

STEP 1 Use VTR 10-ft (3m) interface cable 10R-10 (Ampex Part No. 1418093) or 15-ft (4.5m) cable 10R-15 (Ampex Part No. 1418094).

STEP 2 See Figure 6-7. On genlock adapter set VTR start/stop trigger pulse switch to "+" (rear) position for VTR models NV9400 or CR4400LS. Set switch to "-" (front) position for VTR models CR4400 or CR4400L.

STEP 3 See Figure 6-7. On genlock adapter set tally switch to rear (on) position.

Note

Audio input level for both recorder brands is -20 dBm. In record mode, audio monitoring is possible only for the model CR4400Ls.

6-11 Panasonic or JVC Brand VHS Videotape Recorders

Proceed as follows:

STEP 1 Use VTR 10-ft (3m) interface cable 10R-10 (Ampex Part No. 1418093) or 15-foot (4.5m) cable 10R-15 (Ampex Part No. 1418094).

STEP 2 See Figure 6-7. On genlock adapter, set VTR start/stop trigger pulse switch to "+" (rear) position for Panasonic brands or to "-" (front) position for JVC brands.

STEP 3 See Figure 6-7. On genlock adapter, set tally switch to ON.

For interface with other brand VTRs, contact an Ampex representative.

6-12 PAINT CONTROLS

The red and blue potentiometer paint controls, shown in Figure 6-8, permit the adding of red, blue, or green tone to the picture content. To adjust the controls, first set the W BAL AUTO/PRESET switch on the left side of the camera to PRESET. Adjust the paint controls as desired. Restore the paint controls to midposition when the paint function is no longer required.

6-13 THEORY OF OPERATION

The genlock adapter circuitry is primarily located on three printed wiring assemblies. These are the Genlock PWA, Interface PWA, and the GL AD CNN PWA. A brief circuit description, along with associated schematic diagrams and parts lists are provided in the text that follows:

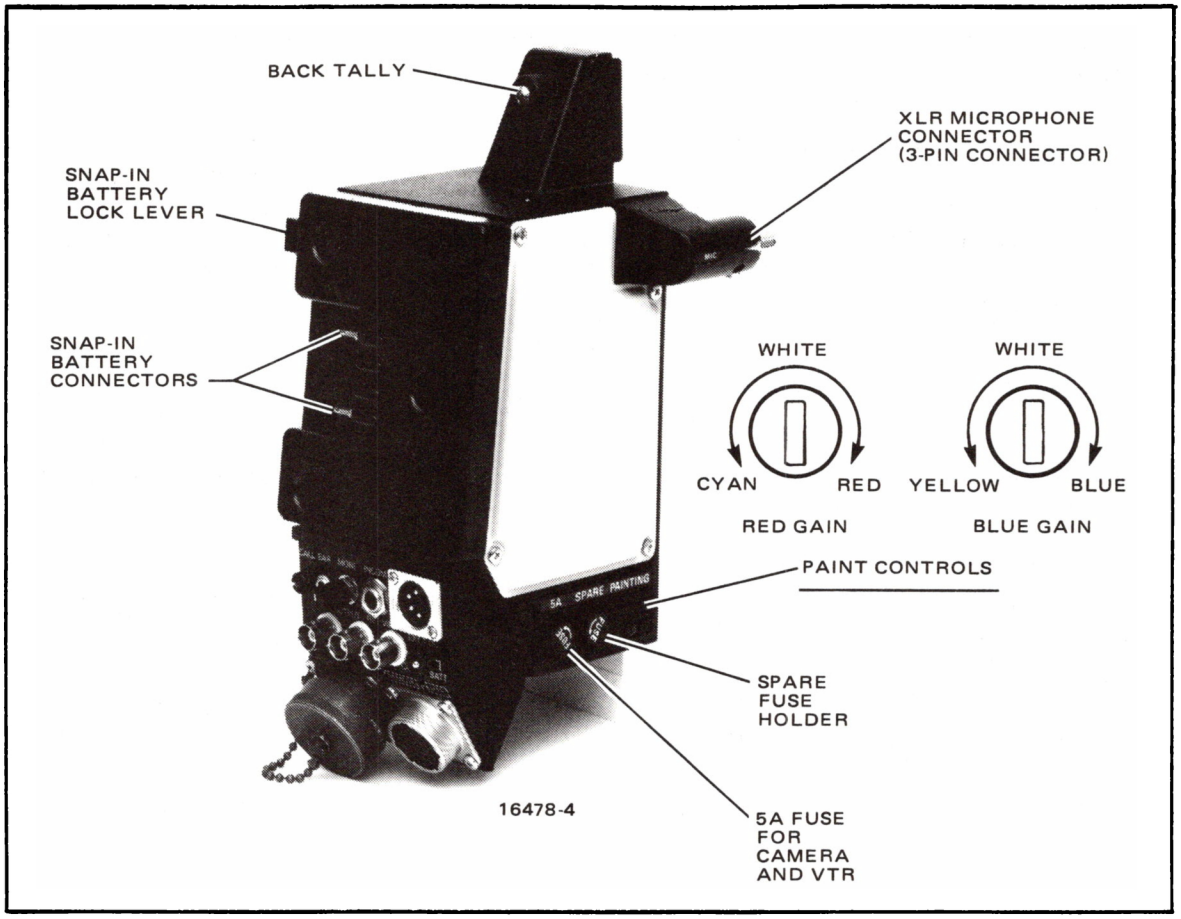


Figure 6-8. Component Locations

6-14 Genlock PWA

The genlock PWA performs the following functions:

- Burst phase comparison for external genlock.
- H-phase comparison for external genlock.
- V-lock pulse generation for external genlock.
- Selection of either RCU or genlock dc error.

The incoming genlock signal, which is either composite video or black burst, is applied to balanced modulator U4 which cancels any noise or hum in the genlock signal. The sync is separated from the genlock signal by comparator U5 and applied to NAND-gates U9, which eliminate the 31.5-kHz component from the sync. The sync is fed to phase comparator U6 where it is phase-compared to a sampling HD pulse from the camera head delayed by gates U7.

The dc error out from phase comparator U6 pin 13 is applied through bidirectional gate U12 to pin 5 of the PWA where it is routed to the camera head.

The separated sync from comparator U5 is also integrated by R69/R70/C31 and is applied to vertical pulse generator U8 to produce a vertical reset pulse. This pulse is routed to the camera head via gates U12 as a V-lock signal.

The subcarrier from the camera head can be delayed in 90° steps by slide switch S1 and differential amplifier U1 which comprise a subcarrier delay circuit. The delayed subcarrier from U1 and burst from U4, via gate U10, is applied to balanced modulator U2 pins 1 and 2 where the signals are compared. The resulting dc error output is sampled by gate U10, amplified by U3 and then routed to the camera head as the SC lock signal.

6-15 Interface PWA

The Interface PWA performs the following functions.

- Amplification of R, B, G cable output signals and selection of either the RBG or the YIQ signal.
- Amplification of the RET video signal.
- Automatic record/playback selection for the NV9400 (Panasonic) and CR4400 (Victor) VTR models.

Transistors Q1 and Q2 are the G channel output amplifiers. Relay K1, responding to the YIQ/RBG command entering the PWA at pin 12, selects either the G or Y signal for routing to the RCU or VTR cable connector. The red and blue channels operate similarly to select between the R and I channels and the B and Q channels, respectively.

Transistors Q8 and Q9 provide noise cancellation for the RET video signal from the RCU or the playback signal from the VTR.

Transistors Q10 and Q11 are signal amplifiers for the RET signal which is routed to the RET video connector and the viewfinder.

VTR interface circuit K4/Q12 clamps the video signal to a positive dc voltage level when playing back signals from a model NV9400 or CR4400 VTR.

Transistor Q12 receives either VTR video or camera video depending on VTR mode record or play. The video signal is detected by Q12 which operates relay K4. The signal is routed to the RET video amplifier circuit.

When using a model NV9400 or CR4400, the video signals are clamped to a positive voltage level during play mode.

6-16 GL AN CNN PWA

Figure 6-9 is a simplified block diagram of the audio portion of the GL AN CNN PWA. This board is used primarily to process the audio signals for VTR and intercom use.

Transistor Q1 is an amplifier for the light-emitting diode back tally light. Transistor Q3 inverts the polarity of the VTR trigger pulse. Components Q2/U4 and U5 convert serial signals BAR/CAM, STBY/OPR, +18 dB, +9dB, and AWBC from the RCU to parallel form for routing to the camera head.

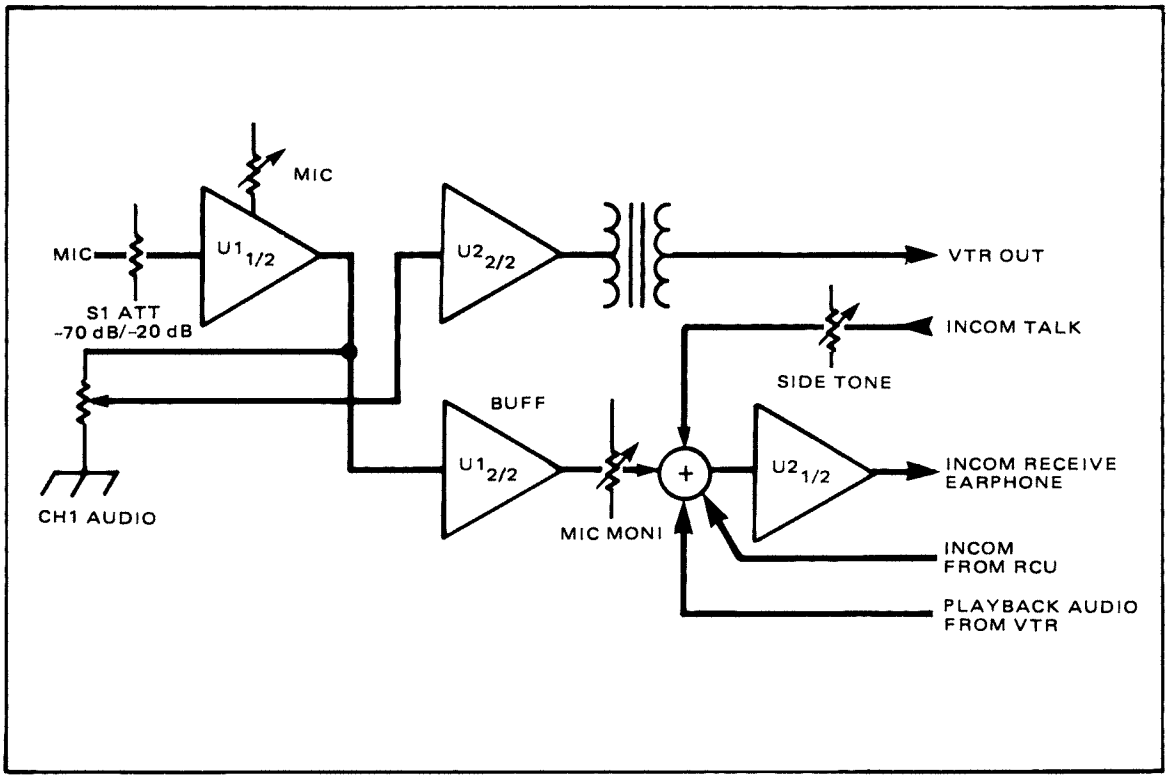


Figure 6-9. GL ANN CNN Board, Audio Portion Simplified Block Diagram

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